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stay connected

Manual IMPACT67-C

- Installation
- Configuration Notes
- General Information on CANopen
- Startup
- Object Directory
- Diagnostics
- Technical Data

Publishing Data

User Manual for

IMPACT67 C DI16 (Article Number: 55075)

IMPACT67 C DI8 DO8 (Article Number: 55076)

IMPACT67 C DO8 (Article Number: 55077)

IMPACT67 C DO16 (Article Number: 55078)

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In addition, our Customer Service Center (CSC) will be glad to assist you:

Our Customer Service Center can support you throughout your project: planning and the conception of customer applications, configuration, installation, and startup. We also offer competent consulting or – in more complex cases – we even provide direct onsite support.

The Customer Service Center provides support tools. It performs measurements for Fieldbus systems, such as Profibus DP, DeviceNet, CanOpen, and AS interface, as well as energy, heat, and EMC measurements.

Our coworkers at the Customer Service Center provide their competence, know-how, and years of experience. They are knowledgeable about hardware and software, and compatibility with products made by various manufacturers.

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About the User Manual and its Structure

Bus Manual:
General explanations and functions for each bus.

On this subject, please click on the links to the next page.

System/Product Manuals:
Describe the system and product-specific features.

Art. No.	Designation
55364	Impact67 ProfiBus
55365	Impact67 CanOpen
55367	Impact67 DeviceNet
55368	Impact67 EtherNet/IP
55369	Impact67 EtherCat

www.murrelektronik.com

Here are links to the bus user manuals:

>>> CANopen (www.can-cia.org)

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Important Information

Symbols and Icons

This manual contains information and instructions you must comply with in order to maintain safety and avoid personal injury or damage to property. They are identified as follows:

Notes indicate important information.

Warnings contain information that, if you ignore this information, may cause damage to equipment or other assets or, if you fail to comply with safety precautions, may constitute a danger to the user's health and life.

These instructions are recommendations issued by Murrelektronik.

Intended Purpose

Before starting the devices, read this manual carefully. Keep it in a location that is accessible to all users at all times.

The products that are described in this manual were developed, manufactured, tested, and documented in compliance with the relevant safety standards. In normal cases, these products do not constitute any danger to persons or objects, provided the handling specifications and safety instructions described in this manual are observed. They conform to the requirements of

- EMC Directive (2004/108/EC)

The products are designed for industrial use. An industrial environment is defined as one in which loads are not connected directly to the public low-voltage power grid. Additional measures must be taken if the products are used in private, business, or trade environments.

The safe, troublefree functioning of the products requires proper transportation, storage, mounting, and installation, and careful operation. Operation of the devices for their intended purposes is only guaranteed when the enclosures are fully mounted. If aggressive media are used, check their material resistance depending on the application.

Current safety and accident prevention laws valid for a specific application must be observed for the configuration, installation, setup, maintenance, and testing of the devices. The power supply must

comply with SELV or PELV. Power sources in accordance with EN 61558-2-6 (transformer) or EN 60950-1 (switched-mode power supply) meet these requirements.

Only use cables that meet the requirements and regulations for safety, electromagnetic compatibility, and, if necessary, telecommunications terminal equipment specifications.

Information on the cables and accessories that are suitable for use with this product are contained in the Appendix to this manual.

Qualified Personnel

Only qualified, trained electricians knowledgeable in the safety standards of automation systems may configure, install, set up, maintain, and test the devices. The requirements concerning qualified personnel are dependent on the requirements profiles described in ZVEI and VDMA. For this reason, electricians must know the contents of the manual "Weiterbildung in der Automatisierung" (Further Training in Automation Systems) published by ZVEI and VDMA published by Maschinenbau-Verlag, Post Box 710864, 60498 Frankfurt, Germany) before installing and maintaining the devices. They are therefore electricians who are capable of assessing the work executed and any possible dangers arising from this due to their professional training, knowledge, experience, and their knowledge of the pertinent standards; or who have a level of knowledge equivalent to professional training due to their many years of activity in a comparable field.

Only Murrelektronik technical personnel are allowed to execute work on the hardware and software of our devices, if they are devices not described in this manual.

Unqualified tampering with the hardware or software, or failure to observe the warnings cited in this manual may result in severe personal injury or damage to property.

1. Description of IMPACT67

Fieldbus modules with IP67 protection are an important module in machine installation and they replace complex wired, and therefore, high-cost terminal boxes. Fieldbuses replace conventional parallel wiring.

An increase in efficiency in installation systems was the prime motivator in developing IMPACT67. Concentration on what is important, coupled with purposeful connectivity, is our recipe for success to reduce your installation costs.

- Application-specific: compact and dense
- Installation-friendly: well designed and pluggable
- Economic: minimized to what is important

System Design Principle

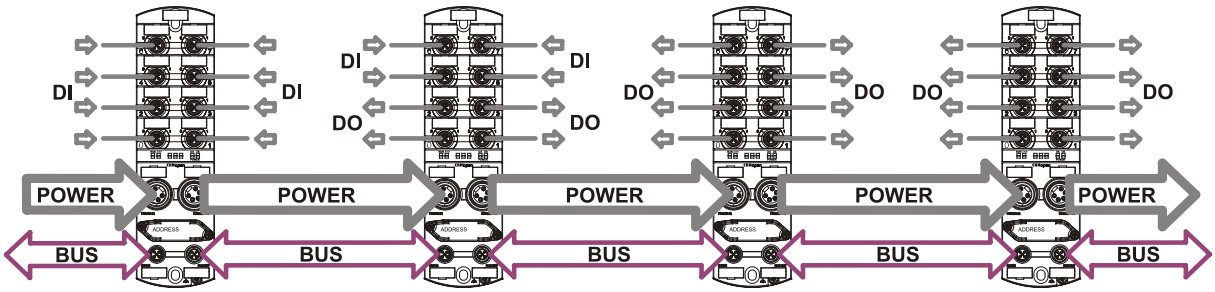


Fig. 1: System design principle

2. Installation

2.1 Mounting

2.1.1 Dimensioning

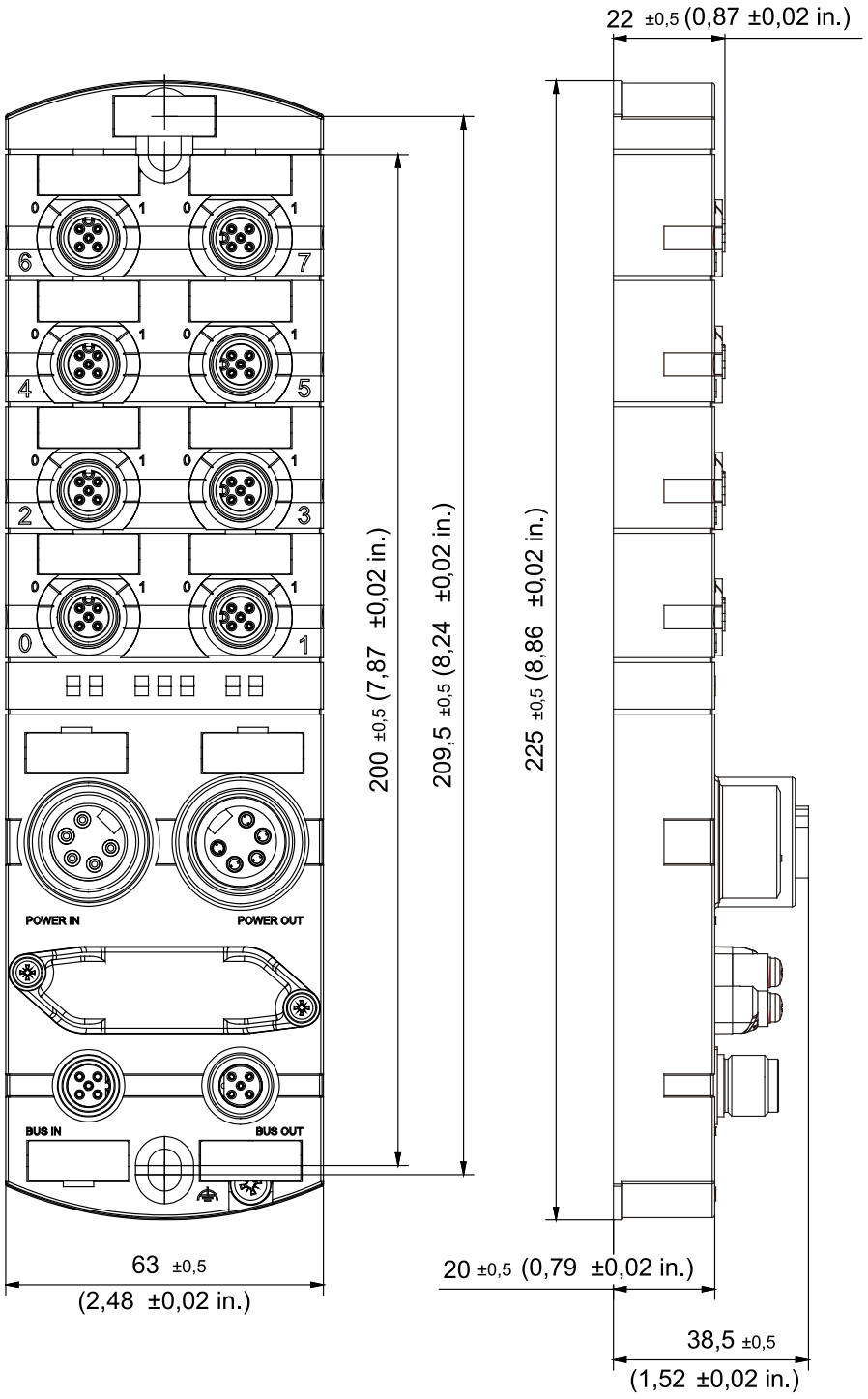


Fig. 2: Dimensioning

2.1.2 Spacing

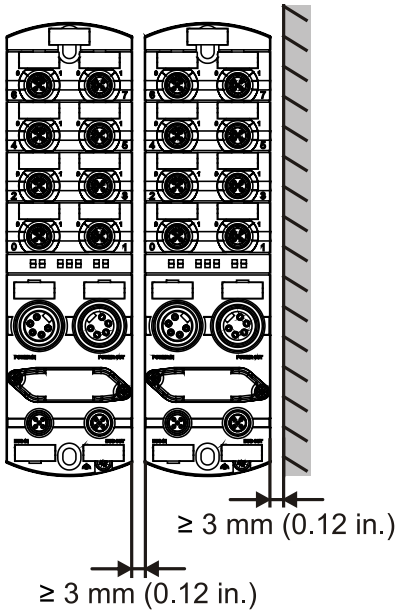


Fig. 3: Spacing

Angled connectors from Murrelektronik require a minimum spacing of 50 mm.

2.1.3 Mounting IMPACT67 Modules

The modules of the IMPACT67 Series can be fitted directly to an installation panel or a machine. The module features two mounting holes for this purpose.

Make sure that the mounting surface is flat and level to prevent mechanical stress in the module housing.

Attach the module using two 6 mm diameter screws and two washers as per DIN 433 T1/T2. The tightening torque is 3 Nm.

Function Ground

The PE connection is located at the bottom facing edge of the module housing. To ensure proper functioning in compliance with the EMC regulations specified in the datasheet, we recommend the use of our grounding strap. It is **not** included in the as-delivered state of the module. You must therefore purchase it separately.

Please refer to the chapter on Accessories.

Connect the PE terminal on the housing at low impedance to the function ground (refer to EMC information).

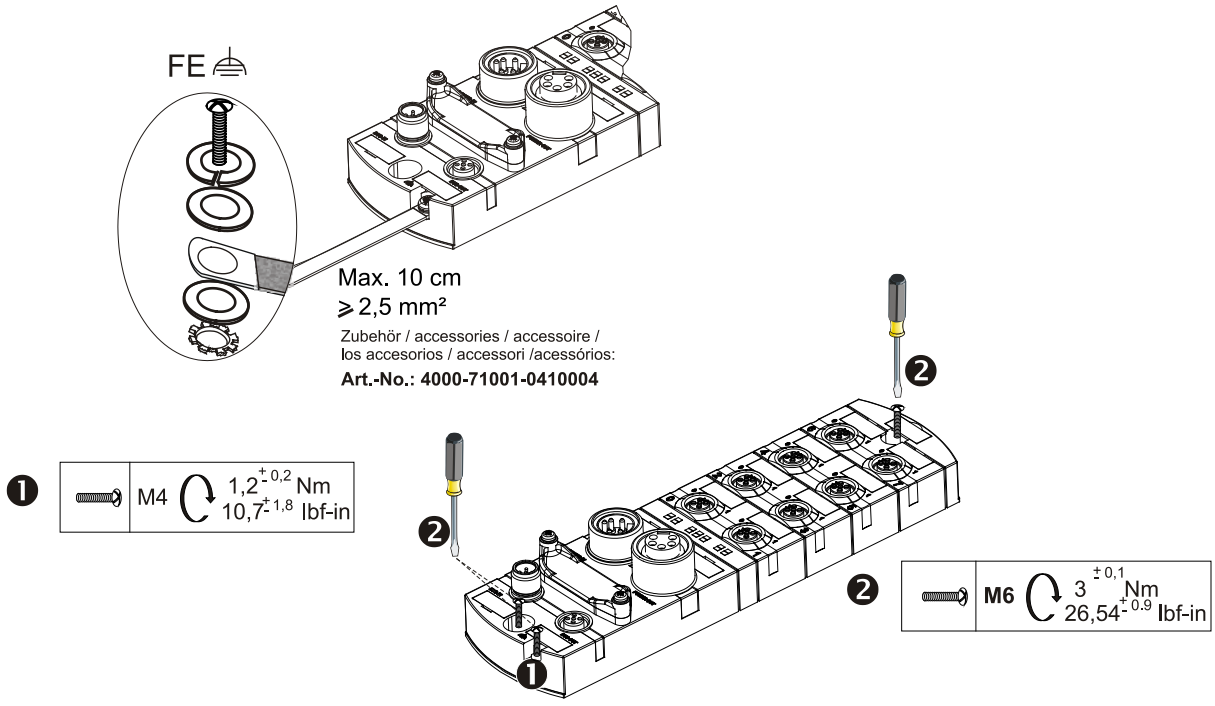


Fig. 4: Mounting

2.1.4 Addressing

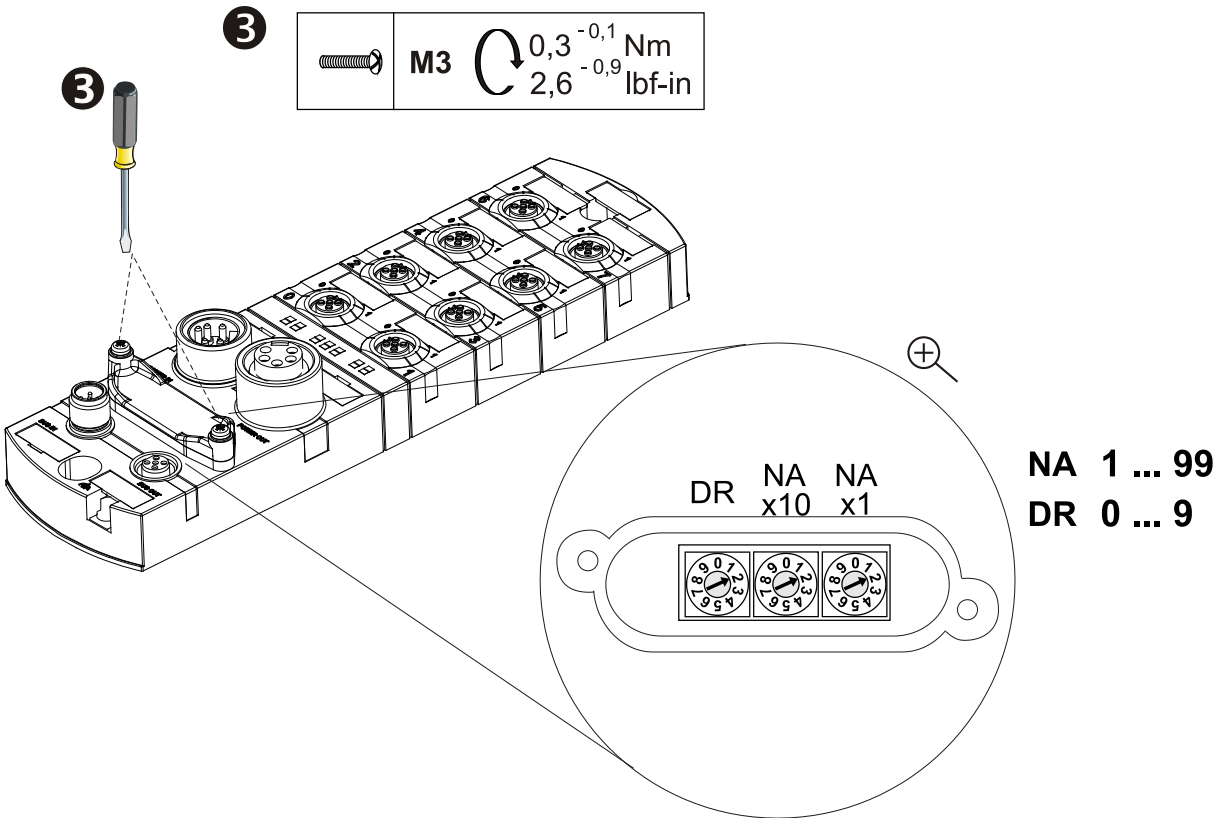


Fig. 5: Data rate and Node ID switches

- NA x10 = Node ID switch ×10
- NA x1 = Node ID switch ×1
- DR = Data rate switch

Further information on addressing is contained in the chapter on Startup.

2.1.5 IP67

IP67 protection is only guaranteed when all sockets are wired up or provided with blank plugs.

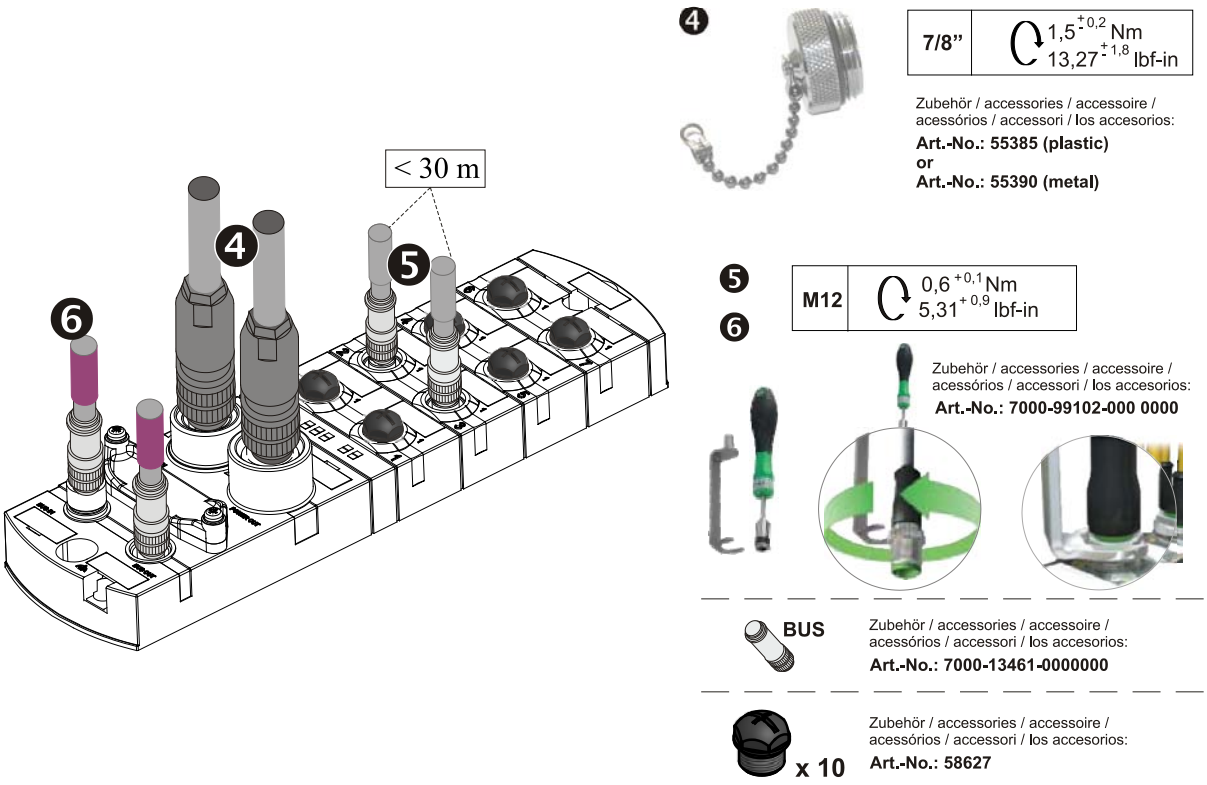


Fig. 6: Example of assembly for IP67

2.2 Connection Diagram of IMPACT67 C

A

IMPACT67-C DI16

M12

Pin 1	+24V Us / 0,2A
Pin 2	DI 10-17
Pin 3	0V
Pin 4	DI 00-07
Pin 5	⏚

A

IMPACT67-C DI8 DO8

M12

M12 0, 1, 2, 3		M12 4, 5, 6, 7	
Pin 1	n.c.	Pin 1	24V Us / 0,2A
Pin 2	DO 04-07	Pin 2	DI 04-07
Pin 3	0V	Pin 3	0V
Pin 4	DO 00-03	Pin 4	DI 00-03
Pin 5	⏚	Pin 5	⏚

DO: 8x 2A

A

IMPACT67-C DO8

M12

M12 0, 2, 4, 6		M12 1, 3, 5, 7	
Pin 1	n.c.	Pin 1	n.c
Pin 2		Pin 2	n.c
Pin 3	0V	Pin 3	0V
Pin 4	DO 00,02, DO 04,06	Pin 4	DO 01,03, DO 05,07
Pin 5	⏚	Pin 5	⏚

DO: 8x 2A

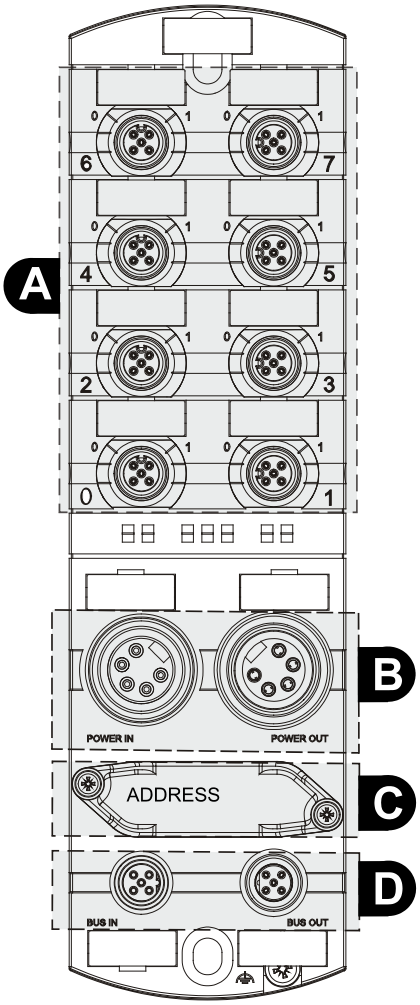
A

IMPACT67-C DO16

M12

Pin 1	n.c.
Pin 2	DO 10-17
Pin 3	0V
Pin 4	DO 00-07
Pin 5	⏚

DO: 16x 0,5A



B

POWER IN

POWER OUT

Pin 1	0V
Pin 2	0V
Pin 3	⏚
Pin 4	+24V U_S / max. 9 A
Pin 5	+24V U_A / max. 9 A

C

Adressierung / Addressing / Adressage / Endereçamento / Indirizzamento / Direccionamiento:

NA 1 ... 99

DR 0 ... 9

DR NA x10 NA x1

DR	0	1	2	3	4	5	6	7	8	9
Kbit/s	Auto	10	20	50	100	125	250	500	800	1000

D

BUS IN

BUS OUT

⏚	**Pin 1**	⏚
n.c.	**Pin 2**	n.c.
CAN_GND	**Pin 3**	CAN_GND
CAN_HIGH	**Pin 4**	CAN_HIGH
CAN_LOW	**Pin 5**	CAN_LOW
⏚	Gewinde Thread Filet Rosca Filetto Rosca	⏚

3. Configuration Notes

3.1 System Components

3.1.1 Product Designation Code

The designation format of IMPACT67 system components explains their function.

Examples:

Name			Description
IMPACT67	**C**	**DI8 DO8**	
			I/O channels D = Digital I = Input O = Output
			Function P = Profibus node DN = DeviceNet node C = CanOpen node EC = EtherCat node E = EtherNet/IP node PN = ProfiNet node
			Product Family

Tab. 1: Example of product designation

3.1.2 IMPACT67 Modules

The purpose of the IMPACT67 system is the decentralized routing of signals at the I/O level and the supply of this information over a Fieldbus network (e.g. Profibus, CAN-open, DeviceNet, EtherCAT, EtherNet/IP).

The module and I/O units are powered by a 5-pin power plug 7/8" (mini style).

Article Number	Description	
55075	IMPACT67 C DI16	
55076	IMPACT67 C DI8 DO8 (2A)	
55077	IMPACT67 C DO8 (2A)	
55078	IMPACT67 C DO16 (0.5A)	

Tab. 2: IMPACT67 C Modules

3.1.3 Accessories

3.1.3.1 Cables

CANopen		
Article Number	**Description**	
	Straight connector / straight connector	Cable length
7000-40531-8030150		1.5 m
7000-40531-8030300		3.0 m
7000-40531-8030500		5.0 m
7000-40531-8030750		7.5 m
7000-40531-8031000		10.0 m

Tab. 3: CANopen

CANopen		
Article Number	**Description**	
	Straight connector / with nonterminated cable end	Cable length
7000-13105-8030150		1.5 m
7000-13105-8030300		3.0 m
7000-13105-8030500		5.0 m
7000-13105-8030750		7.5 m
7000-13105-8031000		10.0 m

Tab. 4: CANopen

Power cable 7/8“		
Article Number	**Description**	
	Straight socket / with nonterminated wire end	Cable length
7000-78021-9610150		1.5 m
7000-78021-9610300		3 m
7000-78021-9610500		5 m
7000-78021-9610750		7.5 m
7000-78021-9611000		10 m

Tab. 5: Power cable 7/8“

Power cable 7/8“		
Article Number	**Description**	
	Straight connector / straight socket	Cable length
7000-50021-9610030		0.3 m
7000-50021-9610060		0.6 m
7000-50021-9610100		1 m
7000-50021-9610150		1.5 m
7000-50021-9610200		2 m

Tab. 6: Power cable 7/8“

Most cables and connectors are available in angled style.

3.1.3.2 Connector for Self-Connection

Article Number	Description
7000-13321-0000000	CANopen bus M12 connector, A-coded, straight
7000-13401-0000000	CANopen bus M12 slot A-coded, straight
7000-00000-8039999	Bus cable for CANopen, 100 m collar
7000-78081-0000000	Power 7/8“ straight connector 5-pin , self-connecting
7000-78201-0000000	Power 7/8" socket straight 5-pin, self-connecting

Tab. 7: Connector for Self-Connection

3.1.3.3 Valve Connector Style A

- Contact spacing 18 mm
- Operating voltage 24 V AC/DC, pressure switch 24 V DC
- Operating current max. 4 A

Article Number	Description	
7000-41341-0000000	M12 top connection	LED yellow, protection circuit for valves
7000-41361-0000000		LED yellow/green for pressure switch
7000-41461-0000000	M12 rear connection	LED yellow, protection circuit for valves
7000-41481-0000000		LED yellow/green for pressure switch

Tab. 8: Valve connector Style A

3.1.3.4 Valve connector combination Style A

- Contact spacing 18 mm
- Operating voltage 24 V AC/DC
- Operating current max. 4 A

Article Number	Description	
	M12 top connection	Cable length
7000-41501-2260000		100 mm
7000-41521-2260000		150 mm
7000-41541-2260000		200 mm
	M12 rear connection	Cable length
7000-41561-2260000		100 mm
7000-41581-2260000		150 mm
7000-41601-2260000		200 mm
Other system accessories on request		

Tab. 9: Valve connector combination Style A

3.1.3.5 Power T fitting 7/8" 5-pin

Article Number	Description	
7000-50061-0000000	Power T fitting 7/8“ 5-pin	

Tab. 10: Power T fitting 7/8“ 5-pin

3.1.3.6 Terminating Resistor

Article Number	Description	
7000-13461-0000000	Terminating resistor connector CANopen	

Tab. 11: Terminating resistor

3.1.3.7 Blank Plug

Article Number	Description
7000-41241-0000000	M12 diagnostic adapter (for line monitoring to bridges)
58 627	M12 plastic plug (SP 10 pieces)
55390	7/8" screw plug, metal with chain (SP 1 piece)
55385	7/8" screw plug, plastic (SP 1 piece)

Tab. 12: Blank plug

3.1.3.8 Identification Labels

Article Number	Description
996067	IDENTIFICATION LABELS 20X8MM (SP 10 pieces)

Tab. 13: Identification labels

3.1.3.9 Grounding Strap

Article Number	Description
4000-71001-0410004	Grounding strap 4 mm² 100 mm for M4 (SP 1 piece)

Tab. 14: Grounding strap

3.1.3.10 Torque Wrench

Article Number	Description
7000-99102-0000000	Set of M12 torque wrenches (SP 1 piece)

Tab. 15: Torque wrench

3.1.3.11 MICO

- – Fire protection (EN 60950-1)
- – Operating voltage protection (EN 61131-2)
- – Operating state memory device (EN 61131-1)

Article Number	Description	Nominal operating branch-circuit current (full load)	
9000-41034-0100400	MICO 4.4 (4 channels)	each 4 A	
9000-41034-0100600	MICO 4.6 (4 channels)	each 6 A	
9000-41034-0401000	MICO 4.10 (4 channels)	each 10 A	

9000-41042-0100400	MICO 2.4 (2 channels)	each 4 A	
9000-41042-0100600	MICO 2.6 (2 channels)	each 6 A	
9000-41042-0401000	MICO 2.10 (2 channels)	each 10 A	

Tab. 16: Overview of MICO Variants

Information on products and accessories are available in our catalog and our online ship at:

onlineshop.murrelektronik.com

3.2 CAN-Bus Descriptions

3.2.1 CAN-Bus Protocol Description

CAN (Controller Area Network) was originally developed only for information exchange within a motor vehicle. The intention was to improve transmission shift operation, for example, by having the transmission inform the engine management of a transmission shift request via CAN. The CAN system was therefore conceived to transmit short messages under real-time conditions. This is also a typical task of machine controls in automation technology. The textile machine industry was amongst the CAN pioneers. Back in 1990 a manufacturer equipped his weaving machines with modular control systems that communicate over the CAN network. Since then, numerous textile machine manufacturers have joined in a "CAN Textfile Users Group". In turn, this group is a member of the international "CAN in Automation" (CiA) user and manufacturers association. In the U.S., a number of corporations employ CAN in their production systems and machine tools as a system-internal or machine-internal bus system to interconnect sensors and actuators. These companies include Honeywell, Allen-Bradley, Coca-Cola, and United Parcel Services. Some users, for example, in medical technology, have opted for CAN because of the extremely high safety requirements they must meet in this field. Manufacturers of safety-sensitive or high-availability machines and systems (e.g. robots and transport systems) have similar problems to solve.

The extremely interesting technical characteristics of CAN, coupled with its low price (due to the volume of units used in the automotive industry), have made CAN a worldwide-accepted bus system in automation technology. In the CAN system, equal rights users (control devices, sensors, and actuators) are interconnected by means of a serial bus. The bus cable itself is a symmetrical or asymmetrical two-wire cable that is either shielded or unshielded, depending on the requirements. The electrical parameters of physical transmission are defined in ISO 11898.

CAN features immunity to high temperatures and interference fields due to its robust protocol and chips. Another of its distinguishing features is its highly robust network performance (hamming distance = 6). Low device connection costs per user, in addition to high transmission reliability, are often a decisive argument in favor of CAN. The availability of CAN chips from different manufacturers is also decisive for price-critical applications. All are naturally compatible with the specifications and OSI standard Layers 1 and 2. Not the least of arguments in its favor is the compactness of the controller chips, e.g. in the area of low-voltage switchgear.

In CAN data transfer, it is not stations that are addressed but messages. These “addresses”, also referred to as identifiers, are marked by a network-wide unique identifier. In addition to identifying content, the identifier also establishes message priority. This is essential for bus assignment when several stations compete for access rights.

To be able to process all transmission requests in a CAN network while complying with latency conditions at possibly low data rates, the CAN protocol must implement a bus assignment method (arbitra-

tion). This method guarantees that simultaneous bus access by several stations always leads to defined bus assignment. Through bit-wise arbitration (CSMA/CA process) based on the identifiers of transferred messages, collision between several transmission-ready stations is clearly resolved, at the latest after 13 (standard format) or 33 bit times (expanded format) of any random time bus access. Unlike message-based arbitration according to the CSMA/CD method, this destruction-free collision resolving method guarantees that no bus capacity is required without user information actually being transferred.

Linking bus access priority to message content has proven itself advantageous in bus overload situations, as compared to the existing CSMA/CD or token method: Despite the low bus transport capacity, all pending transfer requests are processed in the sequence of importance for the total system (according to message priority).

High system and configuration flexibility is achieved, thanks to the above-described content-related method of addressing. Stations can be easily integrated into the existing CAN network without the need for software or hardware changes to the existing stations, if the new stations are solely recipients. As the data transfer protocol does not stipulate any physical target addresses for individual components, the concept of modular electronics is supported, as well as the possibility of multi-reception (broadcast/multicast) and the synchronization of distributed processes.

3.2.2 CANopen Protocol Description

When CAN-based distributed systems are implemented, engineers are rapidly confronted with requirements not yet considered by Layer 1 and Layer 2 protocols. The starting point for CAL (CAN Application Layer) specifications was to provide a communication capability suitable for distributed systems, in the form of a user layer (Layer 7) based on Layer 2 protocol expanded communication capability. CANopen originated from a subentity of CAL. Through the definition of profiles, it is even more specifically tailored for use in standard industrial components. CANopen is a CiA standard (CAN In Automation) and has already found widespread acceptance shortly after its introduction. In Europe, CANopen can be regarded as the decisive standard for the implementation of CAN-based industrial system solutions.

The CANopen profile family is based on a so-called “Communication profile” which specifies the underlying communication mechanisms and their description (DS301). The most important device types being used in industrial automation technology, such as digital and analog I/O modules (DS401), drives (DS402), operating devices (DSP403), regulators (DSP404), programmable controllers (DS405), encoders (DS406), are described in so-called “Device profiles”. The device profiles define the functionality of standard devices of that particular type. The configurability of devices via the CAN-Bus serves as the basis for the manufacturer independence that the profile family aspires to provide.

CANopen is a collection of profiles for CAN-based systems with the following characteristics:

- Open

- Real-time data transfer without protocol overhead
- Modular and scalable
- Devices are interoperable and interchangeable
- Supported by many international manufacturers
- Standardized network configuration
- Access to all device parameters
- Synchronization and
- Cyclical and/or event-oriented process data traffic (short system reaction time) possible.

CANopen specifications are compiled by CAN in Automation (CiA) and partially available to the public. Various suppliers provide source codes for master and slave devices. All manufacturers with certified CANopen products on the market are normally members of the CiA. As a result of our active membership in the CiA, Murrelektronik has profound CANopen know-how for the development of components for this bus system.

You will find us and CiA at:

www.can-cia.com and www.murrelektronik.com

3.2.3 CAN-Bus System Data

The table below illustrates the most important system data.

Transmission medium	Twisted, shielded three-wire line (Can-H, Can-L, Can-GND)
Network topology	Linear bus structure
Data rates	Dependent on the cable length (max. 1000 Kbit/s): 1000 Kbit/s 30 m 800 Kbit/s 50 m 500 Kbit/s 100 m 250 Kbit/s 250 m 125 Kbit/s 500 m 50 Kbit/s 1000 m
Transfer duration	134 µs for an 8 byte telegram at 1000 Kbit/s
Number of bus devices	127
Transmitter output current	>25 mA
Number of I/O points	Standard CAN: 16384 bytes (PDO data)
Addresses	One specific address per device in the range from 0 to 128
Access	Multi-master, messages with priorities
User data	8 bytes per telegram
Terminating resistors	120 Ω, always at each end of the data cable
Error recognition	Identification of faulty messages, automatic repetition
Spur line length[1]	Data rate: 1000 Kbit/s: Max. spur line length: 0.3 m Cumulative spur line length: 1.5 m Data rate: 500 Kbit/s: Max. spur line length: 6.0 m Cumulative spur line length: 30 m

Tab. 17: CAN-Bus System Data

To limit the influence of the reflected wave on signal quality, spur lines should be limited to max. 0.3 m at a data rate of 1 Mbit/s.

[1] Calculation of the max. spur line length is not part of the scope of this manual.
For further information see CiA-DR303-1.

3.2.4 CAN-Bus Level

In CAN, bus levels are differentiated as dominant and recessive. The dominant bus level overwrites the recessive one. If various bus stations transmit both dominant and recessive bus levels simultaneously, the dominant level establishes itself on the bus. The recessive level can establish itself only if it is transmitted by all bus devices simultaneously. The recessive level is “1” (high) and the dominant level “0” (low). When there is no bus transmission traffic, the bus level is recessive.

Every CAN-Bus device must be able to implement the output level variances Vdiff = VCAN_H - VCAN_L shown in the table below. A transmission output current of >25 mA must be possible.

Dominant bus level	Vdiff ≥ 0.9 V
Recessive bus level	Vdiff = -0.5 V to +0.5 V
VCAN_H dominant (nominal)	3.5 V
VCAN_L dominant (nominal)	1.5 V
Bus idle operation	VCAN_H = VCAN_L = +2.5 V

Tab. 18: CAN-Bus Level

3.3 Information for First-Time Users

CANopen is a Fieldbus system for industrial use. Its advantages lie in its application. In particular, the various types of process data transmission permit a host of different applications.

To make the system even easier and safer for first-time users to use, we recommend proceeding as outlined in the table below.

Work phase	Question	Note
Planning	How many I/Os are required in total?	This determines if one or more CANopen networks are required.
Planning	How high is the system power requirement?	Important for the selection of a suitable system power supply unit.
Planning	How large is the entire scope of the system?	Important for selecting the CAN-Bus cable and data rate.
Configuration	How are the NODE IDs of the modules to be assigned?	To avoid addressing errors, create an assignment scheme. Carefully label all addressed modules accordingly.
Installation	Where will the modules be installed?	Depends on the module enclosure type. Either in a switch cabinet or terminal box. Place modules with IP 67 protection close to sensors and actuators to achieve greater efficiency.
Setup	How will the system configuration be executed?	The modules can be configured with a suitable software via the imported EDS file.
Setup	Have all CAN-Bus devices on the bus reported after Power ON?	When all CAN-Bus devices have reported, slave configuration can begin.
Setup	How can a simple I/O function test be performed?	Quick and straightforward, with special, easy-to-use setup tools such as the CANopen Master Simulator). Alternatively, the I/O test can also be performed via PLC software

Tab. 19: Planning and configuration procedure

3.4 Connecting

3.4.1 General Line Routing

Cable routing is a very important criterion for interference-free operation of the equipment. When routing cables, be sure to observe the following:

1. Do not route bus cables parallel to high-voltage cables; where applicable, route in separate bundles, or cable troughs, or channels.
2. The PE cable connection must be star-shaped.
3. Prevent potential differences by connecting equipotential bonding conductors.
4. CAN-Bus cable shields must be attached to the connectors.
5. All analog signals should be carried by shielded cable.
6. Signal and power supply cables to the terminal block should be sufficiently long to prevent pull stresses on the terminals.

3.4.2 Preventing Interference Voltage

The following points must be observed in order to reduce or prevent voltage interference when setting up a system:

1. Shielding devices and cables where stipulated (VDE 0113 and VDE 0829 etc.),
2. Suitable location of the devices and cables.
3. Take appropriate interference suppression measures for devices emitting interference (e.g. frequency transformers, valves, contactors etc.).
4. Make sure that device and shield grounding methods are massive and comprehensive.

3.4.3 Connecting the CAN-Bus

The selection of CAN-Bus cables and the respective data transfer rate takes place in three steps:

1. Determine the required cable core cross-section depending on the number of CAN-Bus devices and cable length.
2. Then establish the specific conductor resistance and/or core cross-section in the AWG.
3. Select the permissible data transfer rate.

Please use the 3 tables below for these 3 steps.

In exceptionally difficult situations, it may not be possible to establish cable parameters and permissible data transfer rates with the procedure described. In such cases, please refer to the ISO 11898, CiA-DS102 and CiA-DR303-1 standards. The following sections are excerpts from these standards.

3.4.3.1 CAN-Bus Cable Description

The CiA-DS102 for bus connection and bus medium enables the realization of open CAN networks as a general industrial field bus. The CiA standard is based on high-speed bus interfacing according to ISO 11898; it also specifies a Sub-D connector and a surge impedance-terminated, two-wire lead cable with common return circuit as transfer medium. The maximum cable length is 1000 meters. The maximum length of spur lines at a data rate of 1000 Kbit/s is 0.3 m. The bus line used must be twisted and shielded. Cable shielding is required because of the transmission technology. For spur lines, a cross-section of 0.25 mm² to 0.34 mm² is usually sufficient. Further CiA-specified cables and connectors are listed in DR303-1.

The maximum length of spur lines at a data transfer rate of 1000 Kbit/s is only 0.3 meters.

The number of CAN-Bus devices must be taken into consideration when selecting the conductor cross-section. The table below lists the limits.

Number of CAN-Bus devices	Cable length in m	Core cross-section in mm²	Cable resistance in Ω
32	200	0.25	<21
	360	0.50	
	550	0.75	
64	170	0.25	<18.5
	310	0.50	
	470	0.75	
100	150	0.25	16
	270	0.50	
	410	0.75	

Tab. 20: Cable cross-sections as a function of cable length and the number of bus devices

Repeaters must be used for more than 30 CAN-Bus participants.

Further selection criteria are the DC parameters listed in the table below.

Cable length in m	Specific cable resistance in mΩ/ m	Core cross-section in mm²	Maximum data rate in Kbits/s
0 to 40	70	0.25 to 0.34 AWG23, AWG22	1000 at 30 m
40 to 300	< 60	0.34 to 0.6 AWG22, AWG20	500 at 100 m
300 to 600	< 40	0.5 to 0.6 AWG20	100 at 500 m
600 to 1000	< 26	0.75 to 0.8 AWG18	50 at 1000 m

Tab. 21: DC Cable Parameters

The parameters listed in the previous table are for networks according to ISO11898-2. In order to minimize voltage drop in the cable, a larger bus-terminating resistor than those specified in ISO11898-2 should be selected for long cable lengths. In the system configuration, the DC connector parameters must also be taken into consideration. For each connector, 5 mΩ to 20 mΩ must be added to the cable resistance.

The ground potential difference at CAN_GND terminals of all CAN-Bus devices should not exceed 2 V.

Plug connectors have a typical DC resistance of 5 m Ω to 20 mΩ.

In approximation, the following is valid for bus termination:

Attention must be paid to ensure that the CAN-Bus between CAN_H and CAN_L is correctly terminated with 120 Ω.

The max. permitted line length as a factor of data rate is listed in the table below.

Data rate in Kbits/s	Cable length in m	Nominal bit time in µs
1000	30	1
800	50	1.25
500	100	2
250	250	4
125	350	8
100	500	10
50	1000	20
20	2500	50
10	5000	100

Tab. 22: Max. permissible cable length as a function of data rate

Installation is greatly simplified through the use of preterminated lines. Wiring errors are avoided and setup is more rapidly successful. Murrelektronik offers Fieldbus cables, power supply cables, sensor cables, and accessories, such as terminating resistors and T-fittings. Field-assembled connectors and cables are also available.

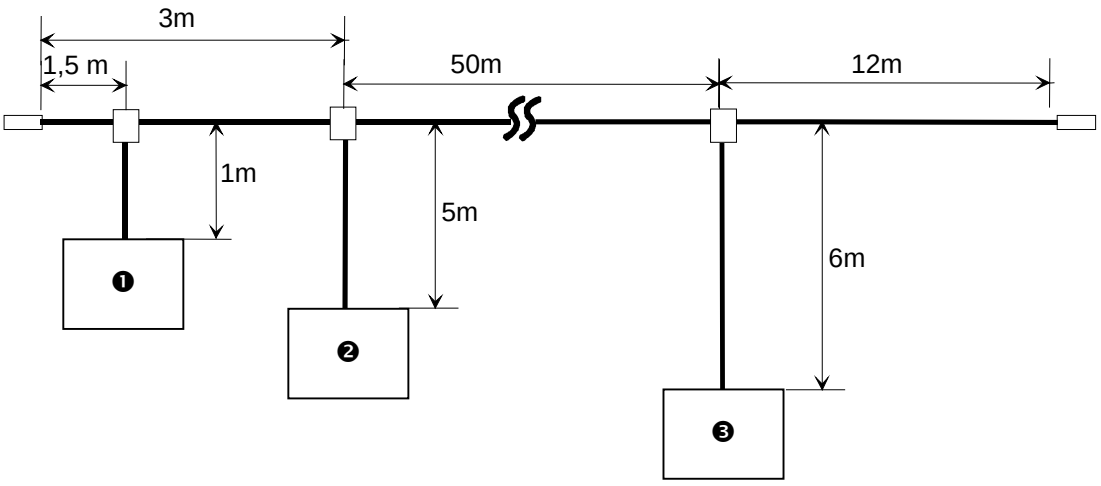
In addition, the specific signal runtime of the CAN-Bus cable must be taken into consideration. This factor lies in a range of 5 ns/m in the case of electrical two-wire cables.

In the case of electrical two-wire cables, the signal run-time is 5 ns/m.

3.4.3.2 Maximum Bus Length and Position of Bus Terminating Resistors

If the distance from a branch in the main cable to its furthest removed module is greater than the distance to the next terminator, this spur line length (Drop B) is calculated in the total cable length.

A sample network is depicted in the table below.



❶ Node 1 (Drop A)

❷ Node 2 (Drop B)

❸ Node 3 (Drop C)

Tab. 23: Position of terminating resistors / maximum bus length

Drop A: does not appear in the max. cable length 1.5 m > 1 m

Drop B: is calculated into the max. cable length 3 m < 5 m

Drop C: does not appear in the max. cable length 12 m > 6 m

Maximum bus length: 5 m + 50 m + 12 m = 67 m

In the above example, the bus terminating resistors are installed at the end of Drop B and at the end of the 12 m cable.

Attention must be paid to ensure that the CAN-Bus between CAN_H and CAN_L is correctly terminated (120 Ω).

3.4.3.3 Connecting the CAN-Bus Cable

Cables

The CAN-Bus network requires cables that conform to ISO 11898 and DR 303-1 standards. We recommend the use of out preterminated CAB-Bus cables which are simple and reliable to install.

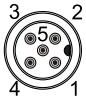
Please refer to the chapter on Accessories.

Connecting to IMPACT67

1. Connect function ground to FE terminal on housing.
2. Connect incoming bus cables to the incoming bus terminal.
3. Connect any expansion bus line to an expansion bus terminal
4. or screw terminating resistor to expansion bus terminal.

Every bus segment must be installed with a terminating resistor at start and end.

M12 bus terminal pin assignment (A-coded)

Connector BUS IN		Socket BUS OUT
		
⏚	**Pin 1**	⏚
n.c.	**Pin 2**	n.c.
CAN_GND	**Pin 3**	CAN_GND
CAN_HIGH	**Pin 4**	CAN_HIGH
CAN_LOW	**Pin 5**	CAN_LOW
⏚	Gewinde Thread Filet Rosca Filetto Rosca	⏚

Tab. 24: Bus connector pin assignment

3.4.4 Power Supplies

We recommend the use of primary switched-mode power supplies in applications with the IMPACT67 and to supply the sensors and actuators.

The power at Pin 4 of the power supply connector must never be switched OFF during operation; otherwise, the IMPACT67 module can no longer participate in CAN-Bus communication.

IMPACT67 modules require a DC power supply in the range of 18 to 30 V.

System-related limit values regarding system power supply must be strictly observed if maximum functional safety and fault-free operation are to be ensured.

Always ensure that the system power, measured at the device furthest from the power supply, does not drop below 18 VDC.

A load current-related voltage drop in the power supply cable occurs due to the central power supply of IMPACT67 modules, including all their connected sensors.

In critical cases, voltage drop optimization is obtainable by changing the location of the power supply unit within the overall system and by using power supply cables with a larger conductor cross-section.

Calculating the required conductor cross-sections is dependent on installation-specific configuration data and is therefore not discussed in this manual.

The power supply module may be damaged if power supply is polarity-reversed. For this reason, we recommend the use of our preterminated 7/8" cables.

3.4.4.1 Connecting the Power Supply to the Module

The auxiliary power is required to power the actuators and sensors. The electronics of the IMPACT67 are powered from the sensor power supply.

The sensor supply voltage may not be of switched-mode design. It powers the module electronics.

The 7/8“ connector is designed to carry a maximum current of 9 A per pin. This is taken into account when connecting the power supply to another circuit.

Power Supply Line

Module supply cables must have VDE approval and a maximum core cross-section of 1.5 mm². All further power supply line characteristics depend on individual applications and are not covered in this manual.

The maximum permitted core cross-section is 1.5 mm².

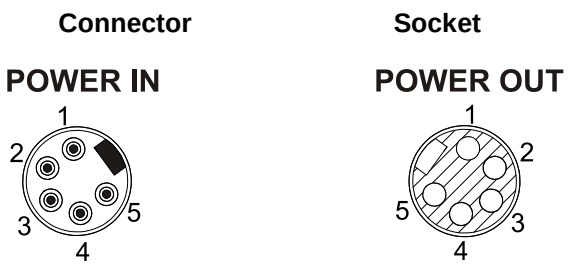
Connecting to IMPACT67

1. Mounting the IMPACT67 module.
2. Attach PE cable to IMPACT67 module.
3. Hook up CAN-Bus connection.
4. Connect power supply.

On IMPACT67 modules, the power supply at Pin 4 of the power supply connector may not be routed through EMERGENCY STOP circuits since this voltage powers the entire I/O section and the sensors.

The actuator power supply (Pin 5) may be designed as a switched-mode device for EMERGENCY OFF circuits (DO modules only).

Pin assignment of 5-pin power plug 7/8" (mini style)



0V	**Pin 1**	0V
0V	**Pin 2**	0V
⏚	**Pin 3**	⏚
+24V U_S / max. 9 A	**Pin 4**	+24V U_S / max. 9 A
+24V U_A / max. 9 A	**Pin 5**	+24V U_A / max. 9 A

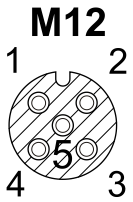
Tab. 25: Pin assignment of power plug

3.4.5 Connecting Sensors and Actuators

3.4.5.1 Connecting Sensors

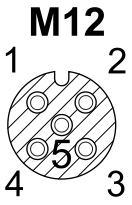
The table below depicts all the general pin assignments for the M12 socket slots

Pin 1	+ 24 V	Sensor supply
Pin 2	Function channel	Channel
Pin 3	0 V	Reference potential
Pin 4	Function channel	Channel
Pin 5	⏚	Function ground



Tab. 26: General Pin Assignment of M12 Slots

3.4.5.1.1. IMPACT67 C DI16



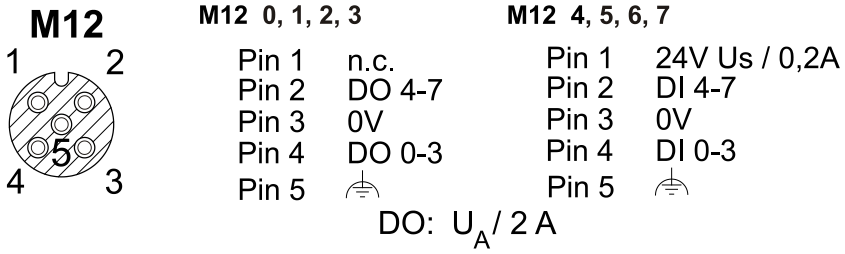
Pin 1 +24V Us / 0,2A
Pin 2 DI 10-17
Pin 3 0V
Pin 4 DI 0-7
Pin 5 ⏚

The table below depicts the assignment between M12 slots and I/O labels.

M12 slot	Channel (Pin 4)	Channel (Pin 2)
0	DI 00	DI 10
1	DI 01	DI 11
2	DI 02	DI 12
3	DI 03	DI 13
4	DI 04	DI 14
5	DI 05	DI 15
6	DI 06	DI 16
7	DI 07	DI 17

Tab. 27: M12 slots to I/O labels

3.4.5.1.2. IMPACT67 C DI8 DO8



The table below depicts the assignment between M12 slots and I/O labels.

M12 slot	Channel (Pin 4)	Channel (Pin 2)
0	DO 00	DO 04
1	DO 01	DO 05
2	DO 02	DO 06
3	DO 03	DO 07
4	DI 00	DI 04
5	DI 01	DI 05
6	DI 02	DI 06
7	DI 03	DI 07

Tab. 28: M12 slots to I/O labels

3.4.5.1.3. Sensor Power Supply

Sensors can be powered directly via pins 1 (+24 V) and 3 (0 V) of the M12 slots. The sensor power supply is protected per M12 slot. This protection is always self-resetting. The maximum current for the sensor power supply is 200 mA per M12 slot. Note the derating in the drawing below:

Derating Sensor Power Supply

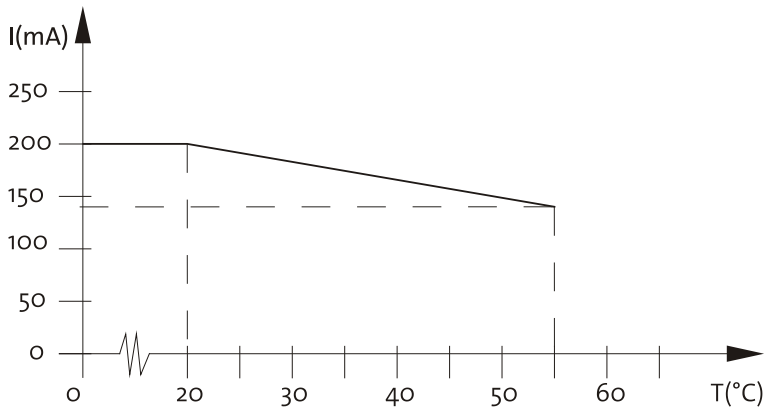


Fig. 7: Derating sensor power supply

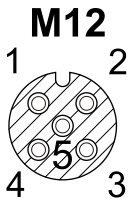
IMPACT67 modules may be loaded to max. 200 mA per M12 slot (sensor current).

If an M12 slot (I/O channel) is not used, it must be fitted with an M12 blank plug in compliance with IP 67 specifications.

3.4.5.2 Connecting Actuators

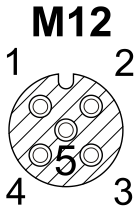
The table below depicts all the general pin assignments for the M12 socket slots

Pin 1	n.c.	not connected
Pin 2	Function channel	Channel
Pin 3	0 V	Reference potential
Pin 4	Function channel	Channel
Pin 5	⏚	Function ground



Tab. 29: General pin assignment of M12 slots

3.4.5.2.1. IMPACT67 C DO16



Pin 1 n.c.
Pin 2 DO 10-17
Pin 3 0V
Pin 4 DO 0-7
Pin 5 ⏚

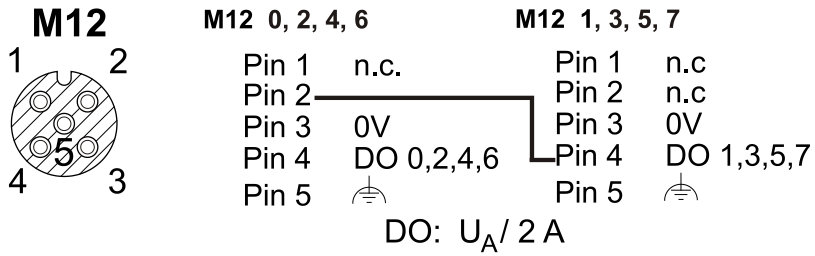
DO: U_A / 0,5 A

The table below depicts the assignment between M12 slots and I/O labels.

M12 slot	Channel (Pin 4)	Channel (Pin 2)
0	DO 00	DO 10
1	DO 01	DO 11
2	DO 02	DO 12
3	DO 03	DO 13
4	DO 04	DO 14
5	DO 05	DO 15
6	DO 06	DO 16
7	DO 07	DO 17

Tab. 30: M12 slots to I/O labels

3.4.5.2.2. IMPACT67 C DO8



The table below depicts the assignment between M12 slots and I/O labels.

M12 slot	Channel (Pin 4)	Channel (Pin 2)
0	DO 00	DO 01
1	DO 01	-
2	DO 02	DO 03
3	DO 03	-
4	DO 04	DO 05
5	DO 05	-
6	DO 06	DO 07
7	DO 07	-

Tab. 31: M12 slots to I/O labels

3.4.5.2.3. Actuators

Each output of the DO8 and DI8/DO8 variants is loadable to max. 2 A.

Each output of the DO16 variant is loadable to max. 0.5 A.

The total current may not exceed 9 A due to the maximum current carry capacity of the 7/8“ power connector.

If the actuator power supply is looped, make sure that the total current of all modules does not exceed 9 A.

The module may be damaged if the actuator power supply polarity is reversed.

The module may heat up depending on the load.

If an overload or a short-circuit occurs at an output, the output is shut down. To reset the output, it must first be reset using the control software.

If an M12 slot (I/O channel) is not used, it must be fitted with an M12 blank plug in compliance with IP 67 specifications.

In order to achieve rapid short-circuit cutoff times, we recommend not to exceed the following lengths:

max. 15 m feed line (POWER IN) 1.5 mm² and max. 1.5 m actuator line 0.75 mm²

max. 10 m feed line (POWER IN) 1.5 mm² and max. 3 m actuator line 0.75 mm²

3.4.6 Unused Connections

Unused sockets must be closed off with blank plugs. Otherwise IP 67 protection is not guaranteed.

4. General Information on CANopen

4.1 Object Directory Structure

CANopen assigns a basic functionality to each device. It is possible to assign further functions that however, must conform to the specifications in the device and communication profile. The device characteristics are specified in the object directory. The object directory is created in the device's range of application. The object directory structure is depicted in the table below. Communication profile data is located in the range between 1000H and 1FFFH (highlighted gray below) and the device profile data between 6000H and 9FFFH.

Index	Object
0000	Not used
0001 - 001F	Static Data Types
0020 - 003F	Complex Data Types
0040 - 005F	Manufacturer-Specific Data Types
0060 - 025F	Device Profile-Specific Data Types
0260 - 0FFF	Reserved for further use
1000 - 1FFF	Communication Profile Area
2000 - 5FFF	Manufacturer-Specific Profile Area
6000 - 9FFF	Standardized Device Profile Area
A000 - AFFF	Standardized Network Variable Area
B000 - BFFF	Standardized System Variable Area
C000 - FFFF	Reserved for further use

Tab. 32: Object Directory Structure

Use the index to access entries in the object directory. The index addresses the entire data format. A given element can be selected from the data structure by means of the subindex. An example of the addressing structure is illustrated in the table below.

Index	Subindex	Description
6000H	0	Number of entries (here 2)
	1	Inputs 0 to 7
	2	Inputs 10 to 17

Tab. 33: Use of index and subindex

4.2 Communication Profile-General Description

The communication profile is based on the services and protocols provided by CAL. It contains functions for distributed synchronous operation, provides a common time base and defines a uniform error signal flow. Application objects assignable to communication objects. The communication profile also establishes system initialization. The CANopen communication model differentiates between four different types of messages (objects):

Administrational Messages (management messages). These encompass layer management (LMT), network management (NMT), and identifier distribution (DBT). Implementation is managed by CAL management services.

Service Data Messages. Service-Data-Objects (SDO) are used for reading and writing entries in the device object directory. The SDOs are implemented by means of CAL application layer services. Each CANopen device supports at least one SDO server.

Process Data Messages. PDO (**P**rocess **D**ata **O**bject) transfer is the most rapid means of transferring data as transmission takes place without an additional protocol. A differentiation is made between synchronous and asynchronous transfer. PDOs are implemented by CAL application services.

Predefined Messages. There are three predefined communication objects: SYNC, Time Stamp, and Emergency Object. Support of these objects is not mandatory. Implementation is via CAL application services.

4.3 Process Data (PDO) – Description of Transmission Modes

CANopen offers various possibilities for transferring process data.

A more detailed description of PDO transmission modes is provided below:

4.3.1 “Change of State” PDO Transmission (Asynchronous)

“Change of state” refers to the changing of an input value (event control). The data is transmitted on the bus immediately after having been modified. The bus bandwidth is optimally used by the event control method, as the entire process image is not constantly being transmitted, but only the modifications of the same. Short reaction times are also achieved, as it is not necessary to wait for the next query by a master when an input value changes.

If the “Change of state” PDO transmission is selected, one must remember that, under certain circumstances, multiple events may occur simultaneously and result in delays until a relatively low priority PDO can be transmitted on the bus. Also, a constantly changing input with high priority PDO must be prevented from blocking the bus (“babbling-idiot”). For this reason, event control is disabled for analog inputs (according to CANopen specifications) as a default condition and must be activated with object 0x6421.

4.3.2 "Remote Transmission Request“ PDO Transmission

PDOs can also be polled by the master via data request telegrams (Remote Frames, so-called RTR telegrams). In this manner, the input image (in the case of event controlled inputs) can also be brought to the bus without input changes, e.g. if a monitor or diagnostics unit is fitted in the network during runtime.

The IMPACT67 C modules do not support this transmission mode.

4.3.3 "Synchronous“ PDO Transmission

It is not only in drive applications that it makes sense to synchronize reading the incoming information with setting the outputs. CANopen supplies the SYNC object for this purpose. This is a high priority CAN telegram with no user data. When it is received, it is used by the synchronized nodes as a trigger to read inputs or set outputs.

4.4 Access to the Object Directory via SDO Access

4.4.1 Errors in SDO Access / SDO Abort Codes

If an access error occurs, the IMPACT67 module transmits a reply with the object to which an access attempt was made. Byte 0 (command specification) contains the value 80H. Bytes 4 to 7 in the SDO comprise the Abort Code, as described in the table below. This is an excerpt from CiA-DS301.

Abort Code	Description
0503 0000h	Toggle bit not alternated
0601 0000h	Unsupported access to an object
0601 0002h	Attempt to write a read only object
0602 0000h	Object does not exist in the object dictionary
0604 0041h	Object cannot be mapped to the PDO
0604 0043h	General parameter incompatibility reason
0604 0047h	General internal incompatibility in the device
0607 0010h	Data type does not match, length of service parameter does not match
0609 0011h	Subindex does not exist
0609 0030h	Value range of parameter exceeded (only for write access)
0609 0031h	Value of parameter written too high
0800 0022h	Data cannot be transferred or stored to the application because of the present device state

Tab. 34: Abort codes during SDO access errors

4.5 Device Profile: General Description

The device profile contains the functionality description of the device. All application objects (functions and parameters) of a device are defined in the device profile. It forms a standardized interface for device functionality. Entries in the object directory are identified through the index. Access to entries is accomplished by means of SDO services which permit entries to be read or written.

4.5.1 Implemented Minimal Device Configuration

The following device configuration is available after the device-internal initialization:

1. Minimal device configuration without dynamic ID distribution. ID assignment is illustrated in the tables below.
2. Static mapping of application objects to PDOs.
3. Synchronous, asynchronous, cyclic, and acyclic PDO transmission with master monitoring during synchronous PDO transmission.
4. Emergency telegrams when an error occurs.
5. CANopen Boot-Up procedure per NMT services and
6. Node guarding and heartbeat.

Object	Function code (Binary)	Resulting COB-ID		CMS Priority
		(Hex)	(Dec)	
NMT	0000	0	0	0
SYNC	0001	80H	128	0

Tab. 35: Broadcast object of predefined master-slave connections

Object	Function code (Binary)	Resulting COB-ID		CMS Priority
		(Hex)	(Dec)	
EMERGENCY	0001	81H - FFH	129 - 255	0 , 1
PDO (tx)	0011	181H - 1FFH	385 - 511	1 , 2
PDO (rx)	0100	201H - 27FH	513 - 639	2
PDO (tx)	0101	281H - 2FFH	641 - 767	2 , 3
PDO (rx)	0110	301H - 37FH	769 - 895	3 , 4
SDO (tx)	1011	581H - 5FFH	1409 - 1535	6
SDO (rx)	1100	601H - 67FH	1537 - 1663	6 , 7
Node-Guarding	1110	701H - 77FH	1793 - 1919	-

Tab. 36: Objects of predefined master-slave connection (as seen from the slave)

4.6 CANopen Boot-Up

In the minimal device equipment, a short boot sequence takes place. This process is illustrated in the figure below.

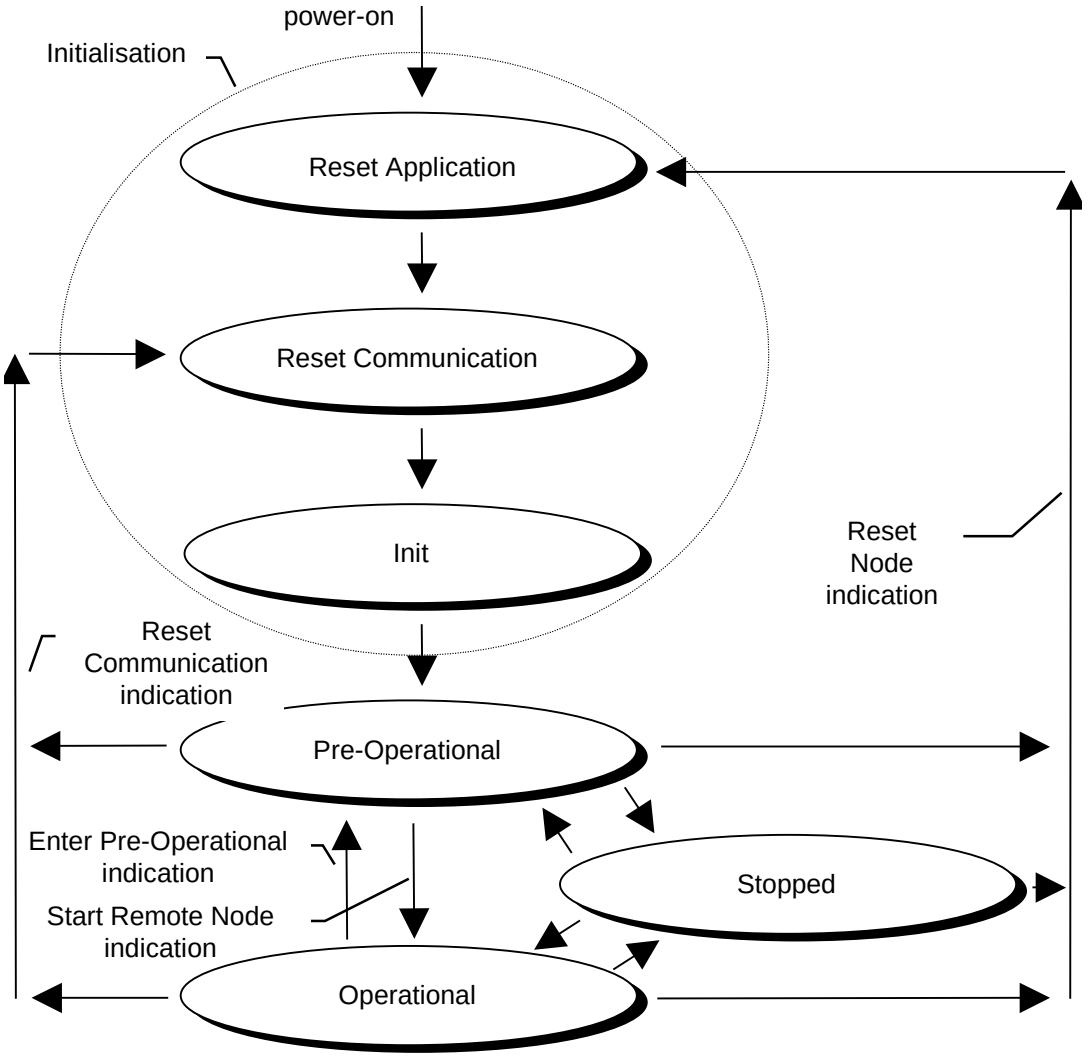


Fig. 8: Status diagram for a CANopen device with minimal device equipment

4.6.1 Reset Application

After a device start or NMT service “Reset node”, the device is in a “Reset application” state. The device profile is initialized in this condition. All device profile entries (objects 6000H – 9FFFH) are then set to the default. When initialization is completed, the device automatically assumes “Reset communication” state.

4.6.2 Reset Communication

This condition is assumed through NMT service “Reset communication” or after “Reset Application”. All parameters (default, according to device configuration) of the supported communication objects (1000H - 1FFFH) are written to the object directory. After this, the device automatically assumes the “Init” state.

4.6.3 Init

All necessary communication objects (SDO, PDO, SYNC, Emergency) are defined during the “Init" state. The assigned CAL services are set up and the CAN controller is configured accordingly while in this state. With this, device initialization is complete and the device assumes “Pre-Operational” state.

4.6.4 Pre-Operational

The device assumes “Pre-Operational” state after a Reset or through NMT Service “Enter Pre-Operational”. In this state, the device can be reconfigured according to its equipment. Only the SDOs, however, are available to read and write device data. The device waits for a network start after the configuration is complete.

4.6.5 Stopped

NMT service “Node stop” causes the device to assume the “Stopped” state. The device cannot be configured in this condition. No services are available to read and write device data (SDO). Only the slave monitoring (Node Guarding) function remains active.

4.6.6 Operational

Full device functionality can be used if the CANopen network is brought into “Operational” state by NMT service “Node start”. Communication can take place via PDOs and via SDOs as well.

Configuration changes during “Operational“ state may have unforeseen effects and should therefore be made only in the “Pre-Operational“ state.

5. Startup

5.1 Terminating CAN-Bus Segments

A terminating resistor (120 ohms) must be fitted to the start and end of each segment.

5.2 System Configuration

After the initialization phase of all CAN-Bus devices, they have reported to the CAN-Bus with one Boot-Up Message each.

Based on the configuration, the master creates a complete periphery map of the slaves in the PLC. The user can assign the read-in I/O bytes to logical addresses in the controller.

This shows the schematic diagram of an CANopen network:

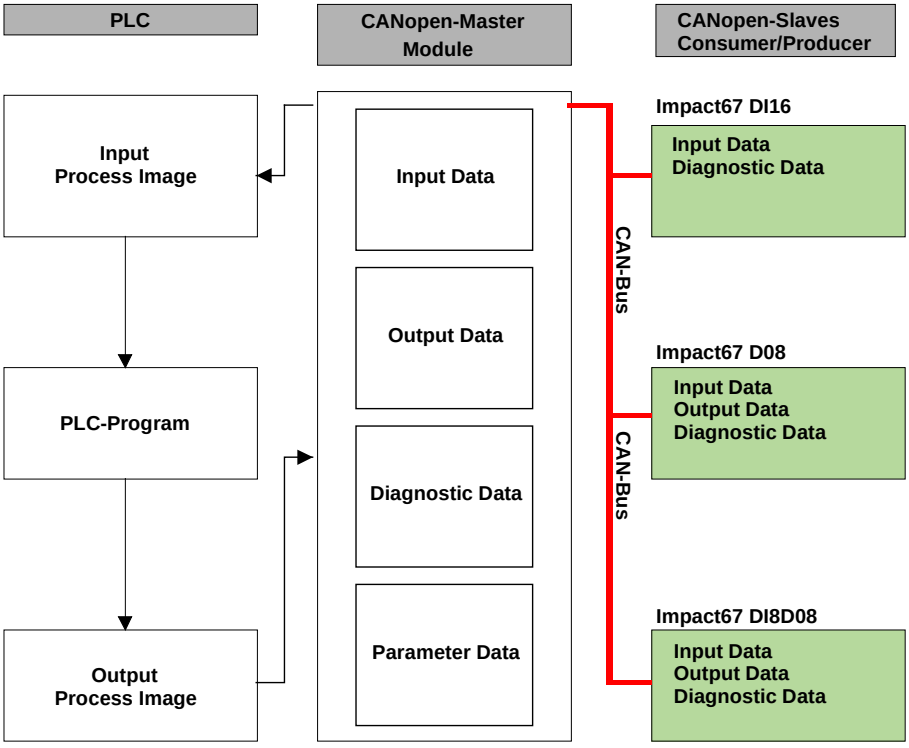


Fig. 9: Data transfer: from the PLC, Interface module (CANopen Master) to CANopen slaves

5.2.1 EDS Files

The EDS file is created explicitly for the device type (I/O). Consequently, each module of the IMPACT67 series has a separate EDS file with the extension (*.eds) plus an icon in the form of a bitmap with the extension (*.ico) assigned to it.

The EDS file contains a lot of information concerning the module e.g.:

Device type, manufacturer, Vendor ID, article number, software version, hardware version, etc.

EDS files are module-specific. Only Murrelektronik technical personnel are allowed to perform application-specific modifications.

EDS files are assigned as shown in the table below:

Module type	Name of EDS file	Name of icon
IMPACT67 C DI16	IMPACT67C_DI16_55075_E_1_1.eds	IMPACT67C_DI16_55075_E_1_1.bmp
IMPACT67 C DI8 DO8	IMPACT67C_DI8DO8_55076_E_1_1.eds	IMPACT67C_DI8DO8_55076_E_1_1.bmp
IMPACT67 C DO8	IMPACT67C_DO8_55077_E_1_1.eds	IMPACT67C_DO8_55077_E_1_1.bmp
IMPACT67 C DO16	IMPACT67C_DO16_55078_E_1_1.eds	IMPACT67C_DO16_55078_E_1_1.bmp

Tab. 37: EDS files

The last character in the EDS file name stands for the EDS file language e.g. D= Deutsch, E= English.

It is of no consequence to the function of the composite network what file is embedded in the startup tool. It only enhances the legibility of the variables.

The latest EDS files are retrievable over the internet at: http://www.murrelektronik.com in the download section under configuration files.

5.2.2 Addressing

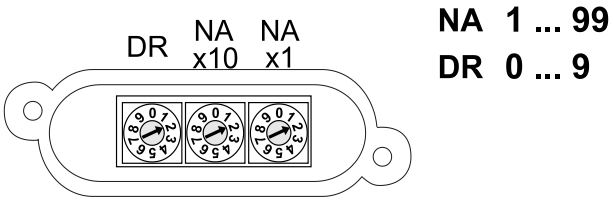


Fig. 10: Data rate and Node ID Switches

There are two switches for setting the Node ID: x10 (decades) and x1 (single digits). Addresses 1 to 99 are permitted. The Node ID is only taken over when the module power supply is applied by the IMPACT67 module. As a result, a power reset must always be made after the Node ID is changed.

Always make sure that the Node ID is unique for each device in the CANopen network.

Address 0 is not allowed.

Data Rate Settings

The data rate is set with a "DR" rotary switch. Bit timing is according to CiA directives.

The following data rates can be set:

Switch Position	Data Rate
0	Automatic recognition
1	10 Kbit/s
2	20 Kbit/s
3	50 Kbit/s
4	100 Kbit/s
5	125 Kbit/s
6	250 Kbit/s
7	500 Kbit/s
8	800 Kbit/s
9	1000 Kbit/s

Tab. 38: Setting the Data Rate

Messages (e.g. SYNC telegrams) must be transferred on the CAN-Bus for automatic data rate recognition (switch position 0) to take place. The IMPACT67 module tries to recognize the data rate used and accepts this as a default. While the IMPACT67 module is searching for the data rate, the RUN and Err LEDs flash at a rate of 10 Hz. When the data rate is finally detected, the IMPACT67 module reverts to "Pre-Operational" state and can be used as a CANopen module. The data rate is searched again every time the module is started up. The detected data rate is not stored. If the data rate requires changing, the IMPACT67 module must be restarted. An NMT reset (reset node or reset communication) is not sufficient to change the data rate.

The data rate search is performed only when module power supply Us is applied. The data rate setting is accepted only when the power supply is turned ON. A power reset is required to change the data rate.

6. Object Directory "Communication Profile“ CanOpen Modules

6.1 Art. No. 55075 IMPACT67 C DI16

Index	Name	Access	Standard value
1000H	Device Type	read only	00010191H
1001H	Error Register	read only	0
1002H	Manufacturer Status Register	read only	0
1003H	Predefined Error Field 1003/0 1003/1-x	read & write read only	*
1005H	COB-ID SYNC Message	read only	80H
1006H	Communication Cycle Period	read only	0
1008H	Manufacturer Device Name	read only	IMPACT67 C DI16
100AH	Manufacturer Software Version	read only	SW1.00
100CH	Guard time	read only	0
100DH	Life time factor	read only	0
1010H	Store parameters	read only	*
1011H	Restore default parameters	read only	*
1014H	COB-ID emergency	read only	80H + Node ID
1016H	Consumer heartbeat time	read only	*
1017H	Producer heartbeat time	read only	0
1018H	Identity Object	read only	*
1200H	Server SDO parameter	read only	*
1400H	Receive PDO Communication Parameter	read only	*
1405H	Receive PDO Communication Parameter	read only	*
1600H	Receive PDO Mapping Parameter	read only	*
1605H	Receive PDO Mapping Parameter	read only	*
1800H	Transmit PDO Communication Parameter	read only	*
1805H	Transmit PDO Communication Parameter	read only	*
1A00H	Transmit PDO Mapping Parameter	read only	*
1A05H	Transmit PDO Mapping Parameter	read only	*

(*) - If no entry is configured under default, the object index has other subindices whose contents are described in detail in the following sections.

Note: The correct defaults are contained in the EDS.

6.2 Art. No. 55076 IMPACT67 C DI8 DO8 2A

Index	Name	Access	Standard value
1000H	Device Type	read only	0x30191H
1001H	Error Register	read only	0
1002H	Manufacturer Status Register	read only	0
1003H	Predefined Error Field 1003/0 1003/1-x	read & write read only	*
1005H	COB-ID SYNC-Message	read only	80H
1006H	Communication Cycle Period	read only	0
1008H	Manufacturer Device Name	read only	IMPACT67 C DI8DO8
100AH	Manufacturer Software Version	read only	SW1.00
100CH	Guard time	read only	0
100DH	Life time factor	read only	0
1010H	Store parameters	read only	*
1011H	Restore default parameters	read only	*
1014H	COB-ID emergency	read only	80H + Node ID
1016H	Consumer heartbeat time	read only	*
1017H	Producer heartbeat time	read only	0
1018H	Identity Object	read only	*
1200H	Server SDO parameter	read only	*
1400H	Receive PDO Communication Parameter	read only	*
1405H	Receive PDO Communication Parameter	read only	*
1600H	Receive PDO Mapping Parameter	read only	*
1605H	Receive PDO Mapping Parameter	read only	*
1800H	Transmit PDO Communication Parameter	read only	*
1805H	Transmit PDO Communication Parameter	read only	*
1A00H	Transmit PDO Mapping Parameter	read only	*
1A05H	Transmit PDO Mapping Parameter	read only	*

(*) - If no entry is configured under default, the object index has other subindices whose contents are described in detail in the following sections.

6.3 Art. No. 55077 IMPACT67 C DO8 2A

Index	Name	Access	Standard value
1000H	Device Type	read only	00020191H
1001H	Error Register	read only	0
1002H	Manufacturer Status Register	read only	0
1003H	Predefined Error Field	read only	*
1005H	COB-ID SYNC Message	read only	80H
1006H	Communication Cycle Period	read only	0
1008H	Manufacturer Device Name	read only	IMPACT67 C DO8
100AH	Manufacturer Software Version	read only	SW1.00
100CH	Guard time	read only	0
100DH	Life time factor	read only	0
1010H	Store parameters	read only	*
1011H	Restore default parameters	read only	*
1014H	COB-ID emergency	read only	80H + Node ID
1016H	Consumer heartbeat time	read only	*
1017H	Producer heartbeat time	read only	0
1018H	Identity Object	read only	*
1200H	Server SDO parameter	read only	*
1400H	Receive PDO Communication Parameter	read only	*
1405H	Receive PDO Communication Parameter	read only	*
1600H	Receive PDO Mapping Parameter	read only	*
1605H	Receive PDO Mapping Parameter	read only	*
1800H	Transmit PDO Communication Parameter	read only	*
1805H	Transmit PDO Communication Parameter	read only	*
1A00H	Transmit PDO Mapping Parameter	read only	*
1A05H	Transmit PDO Mapping Parameter	read only	*

(*) - If no entry is configured under default, the object index has other subindices whose contents are described in detail in the following sections.

6.4 Art. No. 55078 IMPACT67 C DO16 0,5A

Index	Name	Access	Standard value
1000H	Device Type	read only	00020191H
1001H	Error Register	read only	0
1002H	Manufacturer Status Register	read only	0
1003H	Predefined Error Field	read only	*
1005H	COB-ID SYNC Message	read only	80H
1006H	Communication Cycle Period	read only	0
1008H	Manufacturer Device Name	read only	IMPACT67 C DO16
100AH	Manufacturer Software Version	read only	SW1.00
100CH	Guard time	read only	0
100DH	Life time factor	read only	0
1010H	Store parameters	read only	*
1011H	Restore default parameters	read only	*
1014H	COB-ID emergency	read only	80H + Node ID
1016H	Consumer heartbeat time	read only	*
1017H	Producer heartbeat time	read only	0
1018H	Identity Object	read only	*
1200H	Server SDO parameter	read only	*
1400H	Receive PDO Communication Parameter	read only	*
1405H	Receive PDO Communication Parameter	read only	*
1600H	Receive PDO Mapping Parameter	read only	*
1605H	Receive PDO Mapping Parameter	read only	*
1800H	Transmit PDO Communication Parameter	read only	*
1805H	Transmit PDO Communication Parameter	read only	*
1A00H	Transmit PDO Mapping Parameter	read only	*
1A05H	Transmit PDO Mapping Parameter	read only	*

(*) - If no entry is configured under default, the object index has other subindices whose contents are described in detail in the following sections.

6.5 Object Description of Communication Profile

6.5.1 Object 1000H: Device Type (DT)

This object describes the device type and its functionality. The device description consists of two 16-bit fields. The device profile number is written in one of these fields, the other field contains additional information.

Bit	
MSW	**LSW**
Additional Information	Device Profile Number
000XH	0191H

Tab. 39: Structure of Device Type, Object 1000H

Device Profile Number: 401D = 191H

The device profile number 401D equals the number of the CIA standard for I/O devices.

Additional Information: 1st bit set: Digital inputs available

2nd bit set: Digital outputs available

6.5.2 Object 1001H: Error Register (ER)

The device can display internal errors with the 8-bit ER field. If a device error occurs, the corresponding bit is set in the ER. The following errors can be displayed:

Bit	Significance	Comments
0	Generic error	
1	Current	
2	Voltage	
3	Temperature	not supported
4	Communication error	
5	Reserved	not supported
6	Reserved	not supported
7	Manufacturer-specific	Desina diagnostics

Tab. 40: Error register structure, Object 1001H

6.5.3 Object 1002H: Manufacturer Status Register

Diagnostic data are recorded in a 32-bit field. The **lower 8-Bit** of the "Manufacturer Status Register" is contained in the EMCY message and is transmitted at the same time when the diagnostic event occurs. The following table indicates the assignment of the bytes.

Bit	Significance	Comments
0	Sensor undervoltage	
1	Reserved	
2	Actuator undervoltage	
3	Reserved	
4	Sensor short-circuit at M12 socket	
5	Actuator shutdown[2]	
6 to 31	Reserved	

Tab. 41: Description of object 1002H: Manufacturer Status Register

[2] only if outputs are parameterized

6.5.4 Object 1003H: Predefined Error Field (PEF)

"Additional Information" is entered in this 32-bit "error register“ when an error occurs in the LSW of the "Error Code" and in the

MSW. The last error occurring is in Subindex 1.

Existing errors shift to Subindex 2, the error from Subindex 2 shifts to Subindex

3, etc.

Errors can only be deleted as a group by writing 0x00 in object 1003,00.

See **Section 7.4.1.2** for a definition of the error codes.

Error correction does not delete the error Entry in the PEF.

An emergency telegram (EMCY telegram) is always transmitted when an error occurs.

When an error is rectified, an EMCY telegram containing NO ERROR is sent (Error Code

0x0000).

Bit	
MSW	**LSW**
Additional Information	Error Code
0000H	0000H

Tab. 42: Table -: Structure of the predefined error field

Index	**Subindex**	**Additional Information**	**Error Code**	**Description**
1003H	0			Number of errors (8 bit)
	1			Error (32 bit)
	…			
	Max. 10			

Tab. 43: Table-: Structure of the predefined error field

6.5.5 Object 1005H: COB-ID SYNC Message

The communication parameters for the synchronization telegram are stored in this 32-bit field.

Bit number	Value	Meaning / Remarks
31 (MSB)	0	Not relevant
30	0	Device creates no sync-object
29	0	11-Bit ID (CAN 2.0A)
28 – 11	0	Not relevant
10 – 0	X	Identifier

Tab. 44: Description of the SYNC COB-ID entries

6.5.6 Object 1006H: Communication Cycle Period

This object describes the time interval between two SYNC signals in µs. The smallest time unit is 1 ms. This must be kept in mind when selecting SYNC intervals. The entry is made in a 32-bit field. If unused, the field content is zero. If a value between 10 000 and 10 000 000 is listed, the node must receive a SYNC signal within this stated time or the node assumes pre-operational state. The time differential is max. 1% of the set value. Time monitoring begins with the receipt of the first SYNC signal.

Some of the values are entered in the table below:

Object 1006H	Decimal	Hexadecimal	SYNC interval in ms
Default value	0	0H	-
Minimum value	10 000	0000 2710H	10
	25 000	0000 61A8H	25
	250 000	0003 D090H	250
	1 000 000	000F 4240H	1 000
	5 000 000	004C 4B40H	5 000
Maximum value	10 000 000	0098 9680H	10 000

Tab. 45: Description of Object 1006H: Communication Cycle Period

6.5.7 Object 1008H: Manufacturer Device Name (MDN)

With the MDN, device information can be stored in the form of an ASCII string.
The device designation is "IMPACT67 C DI16, or IMPACT67 C DO8, or IMPACT67 C DO16, or IMPACT67 C DI8/DO8“.

6.5.8 Object 100AH: Manufacturer Software Version (MSV)

The software version is entered as an ASCII string in the MSV. The signal "SWx.xx" is transferred when this
object is requested. ”SW1 00“ stands for software version 1.00.

6.5.9 Object 100CH: Guard Time and Object 100DH: Life Time Factor

Description of Node and Life-Guarding Principle

Object 100CH contains the Guard Time in milliseconds. Object 100DH contains the Life Time Factor.

Life Time is calculated as follows:

Life Time = Guard Time x Life Time Factor

If one of the two parameters is "0" (default), there is no master monitoring (no life guarding).

In order to activate time monitoring, set at least value 1 in Object 100DH and enter a time in ms in Object 100CH. To guarantee reliable operation, enter a life time factor of at least 2, otherwise the node will switch to "pre-operational" state without the existence of an error in the event of a delay (e.g. caused by high-priority messages or internal processing of the Node Guarding Master).

In the guarding process, the Master Remote Frame (remote transmit request, message request telegrams) transmits to the guarding identifier of the monitored slaves. The slaves respond with the guarding message. The message contains the slave status code and a toggle bit which must change after every message. If the status or toggle bit fails to match the status expected by the NMT master, or if there is no response, the master assumes there is a slave error.

If the master requests guarding messages in a strict cycle, the slave may detect the failure of the master. In this case, the slave receives no message request from the master within the set "life time" (guarding error), and assumes that the master has failed (watchdog function). Then the slave sets its outputs to error state and reverts to pre-operational state. These two monitoring mechanisms are of special importance in CANopen since the modules do not report in event-controlled mode at regular intervals.

The master remote request also generates a reply without entries in the Guard Time or Life Time Factor objects. Time monitoring is only activated if values greater than 0 are entered in the two objects. Typical Guard Time values range from 250 ms to 2 seconds.

6.5.10 Object 1010H: Save Parameters

Using this object, module parameters can be saved in a nonvolatile memory (flash) and reloaded automatically from there after a voltage reset.

Subindex	Default Value	Description
0	4	Largest subindex supported
1		Save all parameters
2		Save communication parameters (1000H–1FFFH)
3		Save application parameters (6000H–9FFFH)
4		Save application parameters in manufacturer-specific object area (2000H–5FFFH)

Tab. 46: Save Parameters

To save the parameters, "save" (6576 6173) must be written in the related subindex.

Please remember that no outputs are set for "Save all parameters" (Subindex 1) or "Save application parameters" (Subindex 3). Saving is not permitted in this state and the device replies with an SDO Transfer Error Message:

0800 0022h.

When the correct signature is received, the device saves the parameters and then confirms this process

by sending an SDO transmission (initiate download response). If the save operation fails,

the device replies with an SDO Transfer Error Message: 06 0000h).

Signature	MSB			LSB
ISO 8859 ("ASCII")	e	v	a	s
Hex	65	76	61	73

Tab. 47: SDO

If an incorrect signature was written, the device does not save the parameters and

replies with an SDO Transfer Error Message: 0800 002xh).

In the event of a read access to a subindex, the device return information via the supported

memory function (32-bit) as follows:

Bits	Value	Significance
31 – 2	0	Reserved
1	0 1	The device does not save the parameters automatically. The device saves the parameters automatically.
0	0 1	The device does not save the parameters on command. The device saves the parameters on command.

Tab. 48: Read access to a subindex

6.5.11 Object 1011H: Restore Default Parameters

CANopen uses this object to restore default parameters stored in the firmware.

Subindex	Default Value	Description
0	4	Largest subindex supported
1		Restore all parameter
2		Restore communication parameters (1000H–1FFFH)
3		Restore application parameters (6000H–9FFFH)
4		Restore application parameters in manufacturer-specific object area (2000H–5FFFH)

Tab. 49: Restore default parameters

To save the default parameters, "load" (6461 6F6C) must be written in the related subindex.

When the correct signature is received, the device restores the parameters and then confirms this process

by sending an SDO transmission (initiate download response). If the restore operation

fails, the device replies with an SDO Transfer Error Message: 0606 0000h

Signature	**MSB**			**LSB**
ISO 8859 ("ASCII")	d	a	o	l
Hex	64	61	6F	6C

Tab. 50: SDO

If an incorrect signature was written, the device does not restore the parameters and

replies with an SDO Transfer Error Message: 0800 002xh).

The default values are taken over after a device reset (NMT Reset Node for Subindex 1h –

4h, NMT Reset Communication for Subindex 2h), or a power reset.

When a read access to a subindex occurs, the device sends back information via the supported restore function (32-bit) as follows:

Bits	**Value**	**Significance**
31 – 1	0	Reserved
0	0 1	The device does not restore the default parameters The device restores the default parameters

Tab. 51: Read access to a subindex

6.5.12 Object 1014H: COB-ID Emergency Message

The value entered in this object is used as a COB-ID for emergency node messages. When changing the COB-ID, no value may be used that is being used in the node or in the network as a COB-ID for another message. The structure of the EMCY-COB-ID is shown in the table below.

	Bit				
	MSB				**LSB**
	31	30	29	28 - 11	10 - 0
CAN 2.0A:	0	0	0	000000000000000000	11-bit identifier

Tab. 52: Structure of EMCY COB-ID entry, object 1014H

6.5.13 Object 1016H: Consumer Heartbeat Time

The Consumer Heartbeat Time defines the expected heartbeat cycle time and should be configured higher

than the corresponding Producer Heartbeat Time of the device that sends the heartbeat.

Monitoring starts after the reception of the first heartbeat. If the entry of the

Consumer heartbeat time is 0, it is not used. The entered time is multiplied by 1 ms.

Subindex	PDO Mapping	Access	Default Value	Description
0	No	Ro	01h	
1	No	Rw	0	Consumer heartbeat time

Tab. 53: Heartbeat

Structure of Consumer Heartbeat Time entry (32-bit).

	MSB		LSB
Bits	31 – 24	23 – 16	15 – 0
Value	Reserved	Node ID	Heartbeat Timer
Coded as	-	Unsigned8	Unsigned16

Tab. 54: Consumer Heartbeat Time entry

6.5.14 Object 1017H: Producer Heartbeat Time

The Producer Heartbeat Time defines the cycle time of the heartbeat transmitted. If the entry is 0, the Producer Heartbeat Time is not used and the node sends no heartbeat. The time has to be a multiple of 1 ms.

Subindex	PDO Mapping	Access	Default Value	Description
0	No	Rw	00h	

Tab. 55: Producer Heartbeat Time

6.5.15 Object 1018H: Identity Object

Object 1018H contains general information about the device. The Vendor ID

(manufacturer identification number issued by CiA) is entered in Subindex 1, the Article Number of the

IMPACT67 is in Subindex 2, and Subindex 3 contains the revision number that is divided into

a main revision number and a secondary revision number. If the CANopen functionality is expanded, the

main revision number is incremented. The secondary revision number is incremented when there are software changes,

the device functionality is changed, but there is no impact on CANopen functionality.

6.5.15.1 Art. No. 55075 IMPACT67 C DI16

Index	Subindex	Description	Default value
1018H	0	Number of entries	3
	1	Vendor ID (32 bit)	4F
	2	Product Code (32 bit)	D723H = 55075D
	3	Revision Number (32 bit)	00010001H

Tab. 56: Identity Object

6.5.15.2 Art. No. 55076 IMPACT67 C DI8 DO8 2 A

Index	Subindex	Description	Default value
1018H	0	Number of entries	3
	1	Vendor ID (32-bit)	4F
	2	Product Code (32 Bit)	D724H = 55076D
	3	Revision Number (32 Bit)	00010001H

Tab. 57: Identity Object

6.5.15.3 Art. No. 55077 IMPACT67 C DO8 2 A

Index	Subindex	Description	Default value
1018H	0	Number of entries	3
	1	Vendor ID (32 Bit)	4F
	2	Product Code (32 Bit)	D725H = 55077D
	3	Revision Number (32 Bit)	00010001H

Tab. 58: Identity Object

6.5.15.4 Art. No. 55078 IMPACT67 C DO16 0.5 A

Index	Subindex	Description	Default value
1018H	0	Number of entries	3
	1	Vendor ID (32-bit)	4F
	2	Product Code (32 Bit)	D726H = 55078D
	3	Revision Number (32 Bit)	00010001H

Tab. 59: Identity Object

6.5.16 Object 1200H: Server SDO Parameter

This object contains the COB-ID for the communication between client and server in Subindex 1 and the COB-ID in the opposite direction in Subindex 2.

Index	Subindex	Description	Default value
1200h	0	Number of entries	2
	1	Client to Server	600H + Node ID.
	2	Server to Client	580H + Node ID

Tab. 60: Server SDO Parameters

6.5.17 Objects 1400H and 1405H: Receive PDO Communication Parameters

Communication parameters for Receive PDOs are stored in these objects. The parameters are:

- PDO COB-ID in **Subindex 1**
- PDO transmission mode (asynchronous, cyclic synchronous and acyclic synchronous**) in Subindex 2**.

Description of Subindex 1 (32-bit):

Bit Number	Value	Significance
31 (MSB)	0	PDO valid
	1	PDO not valid
30	0	RTR allowed
	1	RTR not allowed
29	0	11-Bit ID (CAN 2.0A)
28 – 11	0	0 since Bit 29 = 0
10 – 0	-	Bit 10 - 0 of the identifier

Tab. 61: Receive PDO communication parameters

Description of Subindex 2 (8-bit):

Trans-mission-Code	PDO transmission modes					Comments
	Cyclical	Acyclic	Synchro-nous	Asynchro-nous	RTR only	
0		X	X			Update data after the Sync message following the receipt of PDO
1 – 240 *	X		X			Update data x Sync-message following the receipt of PDO
241 – 251	Reserved					
252	not supported					
253	not supported					
254				X		Output data taken over on receipt of PDO such as 255
255				X		Update data taken over on receipt of PDO

(*)(indicates the number of SYNC objects that are necessary to transfer the PDOs

Tab. 62: Description of Subindex 2

6.5.17.1 Art. No. 55075 IMPACT67 C DI16

→ does not support receive PDO, therefore there are no communication parameters

6.5.17.2 Art. No. 55076 IMPACT67 C DI8 DO8 2A

→ supports 1 receive PDO

Index	Subindex	Description	Default
1400h	0	Number of entries of the 1st Receive PDO	2
	1	COB-ID of PDO (32-bit)	200H + Node ID
	2	Transmission mode (8-bit)	FFH

Tab. 63: PDO

6.5.17.3 Art. No. 55077 IMPACT67 C DO8 2A

→ supports 1 receive PDO

Index	Subindex	Description	Default
1400h	0	Number of entries of the 1st Receive PDO	2
	1	COB-ID of PDO (32-bit)	200H + Node ID
	2	Transmission mode (8-bit)	FFH

Tab. 64: PDO

6.5.17.4 Art. No. 55078 IMPACT67 C DO16 0.5 A

→ supports 1 receive PDO

Index	Subindex	Description	Default
1400h	0	Number of entries of the 1st Receive PDO	2
	1	COB-ID of PDO (32-bit)	200H + Node ID
	2	Transmission mode (8-bit)	FFH

Tab. 65: PDO

6.5.18 Objects 1600H and 1605H: Receive PDO Mapping Parameters

This object is used to assign received data to entries in the object directory.
The parameters are entered in a subindex.

The value is entered in a 32-bit field. This field is divided into one 16-bit and two 8-bit areas.
The index of the assigned object is found in the 16-bit field.
The first 8-bit field carries the subindex while the second 8-bit field states the length of the assigned entry. The table below depicts the relationship as an example.

MSB		LSB
Index (16-bit)	Subindex (8-bit)	Object length (8-bit)
6200h	01h	08h

Tab. 66: Receive PDO mapping parameters

6.5.18.1 Art. No. 55075 IMPACT67 C DI16

→ no receive PDO

6.5.18.2 Art. No. 55076 IMPACT67 C DI8 DO8 2A

Index	Subindex	Description	Default value
1600H	0	Number of assigned objects, 1st receive PDO	1
	1	1st assigned object, digital outputs Pin 4/Pin 2	6200 01 08h

Tab. 67: Receive PDO

6.5.18.3 Art. No. 55077 IMPACT67 C DO8 2A

Index	Subindex	Description	Default value
1600H	0	Number of assigned objects, 1st receive PDO	1
	1	1st assigned object, digital outputs Pin 4	6200 01 08h

Tab. 68: Receive PDO

6.5.18.4 Art. No. 55078 IMPACT67 C DO16 0.5 A

Index	Subindex	Description	Default value
1600H	0	Number of assigned objects, 1st receive PDO	2
	1	1st assigned object, digital outputs Pin 4	6200 01 08h
	2	2nd assigned object, digital outputs Pin 2	6200 02 08h

Tab. 69: Receive PDO

6.5.19 Objects 1800H and 1805H: Transmit PDO Communication Parameters

Communication parameters for Transmit PDOs are stored in these objects. The parameters are:

- COB-ID of the PDO
- PDO transmission mode (asynchronous, cyclic synchronous, and acyclic synchronous).
- Inhibit time, or an
- Event timer.

Every parameter is entered in a subindex.

The entries for Subindex 1 and 2 are equivalent to those in Section **6.5.17 "Receive PDO Communication Parameters".**

Inhibit Time (Subindex 3)

In the case of Transmit PDOs, the inhibit time for PDO transmission can be entered in this 16-bit field. After a data change, the system checks before sending the PDO whether the inhibit time has expired since the last transmission. A new PDO transmission can take place only when the inhibit time has elapsed. The inhibit time is useful in asynchronous transmission (transmission mode 255) in order to avoid CAN-Bus overloads. Inhibit Time is a multiple of 100 µs and can be entered in Object 1800,03/1805,03. The table below lists calculated inhibit times.

Object 1800,03 or 1805,03	Inhibit Time in ms
0000H	0
0064H	10
03E8H	100
1388H	500
2710H	1000
FFFFH	6553

Tab. 70: Inhibit time examples

After a data change, the TxPDO is transmitted again only when the inhibit time has expired, even if synchronous operation is set.

Event Timer (Subindex 5)

The event timer functions only in asynchronous transmission (transmission mode 255). If data changes before the event timer expires, an interim telegram is sent.

If a value >0 is entered in this 16-bit field, the TxPDO is always transmitted after the event timer expires. The value entered in 1800,05 and 1805,05 is the event timer in ms. Data transfer also takes place without data changes.

Object 1800,05 or 1805,05	Event Time in ms
0000h	0
000Ah	10
0064h	100
01F4h	500
03e8h	1000
1388h	5000
2710h	10000

Tab. 71: Event timer examples

The event timer functions only in asynchronous transfer (transmission mode 255).

If inhibit time and event timer are used at the same time, the inhibit time must be smaller than the event time. Otherwise, the event time would expire before the inhibit time and this would make the function illogical.

6.5.19.1 Art. No. 55075 IMPACT67 C DI16

Index	Subindex	Description	Default value
1800H	0	Number of entries of 1st transmission PDO	5
	1	COB-ID of PDO (32-bit)	180H + Node ID.
	2	Transmission mode	FFh
	3	Inhibit time (16-bit)	0000H
	5	Event timer (16-bit)	0000H
1805H	0	Number of entries of 2nd Transmit PDO	5
	1	COB-ID of PDO (32-bit)	80000280h + Node ID
	2	Transmission mode	FFh
	3	Inhibit time (16-bit)	0000H
	5	Event timer (16-bit)	0000H

Tab. 72: Transmit PDO Communication Parameters

6.5.19.2 Art. No. 55076 IMPACT67 C DI8 DO8 2A

Index	Subindex	Description	Default value
1800H	0	Number of entries of 1st transmission PDO	5
	1	COB-ID of PDO (32-bit)	180H + Node ID.
	2	Transmission mode	FFh
	3	Inhibit time (16-bit)	0000H
	5	Event timer (16-bit)	0000H
1805H	0	Number of entries of 2nd Transmit PDO	5
	1	COB-ID of PDO (32-bit)	80000280h + Node ID
	2	Transmission mode	FFh
	3	Inhibit time (16-bit)	0000H
	5	Event timer (16-bit)	0000H

Tab. 73: Transmit PDO Communication Parameters

6.5.19.3 Art. No. 55077 IMPACT67 C DO8 2A

Index	Subindex	Description	Default value
1805H	0	Number of entries of 1st transmission PDO	5
	1	COB-ID of PDO (32-bit)	80000280H + Node ID
	2	Transmission mode	FFh
	3	Inhibit time (16-bit)	0000H
	5	Event timer (16-bit)	0000H

Tab. 74: Transmit PDO Communication Parameters

6.5.19.4 Art. No. 55078 IMPACT67 C DO16 0.5 A

Index	Subindex	Description	Default value
1805H	0	Number of entries of 1st transmission PDO	5
	1	COB-ID of PDO (32-bit)	80000280H + Node ID
	2	Transmission mode	FFh
	3	Inhibit time (16-bit)	0000H
	5	Event timer (16-bit)	0000H

Tab. 75: Transmit PDO Communication Parameters

The COB-ID of the PDO with Index 1805H is deactivated by default, i.e. the PDO is not transmitted.

6.5.20 Objects 1A00H and 1A05H: Transmit PDO Mapping Parameters

6.5.20.1 Art. No. 55075 IMPACT67 C DI16

Index	Subindex	Description	Default value
1A00H	0	Number of assigned objects, 1st Transmit PDO	2
	1	1st assigned object, digital inputs Pin 4 00 to 07	6000 01 08H
	2	2nd assigned object, digital inputs Pin 2 10 to 17	6000 02 08H
1A05H	0	Number of assigned objects, 2nd Transmit PDO	2
	1	1st assigned object, Common diagnosis	3000 01 08H
	2	2nd assigned object, Reserved	3000 02 08H

Tab. 76: Transmit PDO mapping parameters

6.5.20.2 Art. No. 55076 IMPACT67 C DI8 DO8 2A

Index	Subindex	Description	Default value
1A00H	0	Number of assigned objects, 1st Transmit PDO	1
	1	1st assigned object, digital inputs Pin 4/2 00 to 07	6000 01 08H
1A05H	0	Number of assigned objects, 2nd Transmit PDO	4
	1	1st assigned object, group diagnostic	3000 01 08H
	2	2nd assigned object, Reserved	3000 02 08H
	3	3rd assigned object, Actuator short-circuit Pin 4	3000 03 08H
	4	4th assigned object, Actuator short-circuit Pin 2	3000 04 08H

Tab. 77: Transmit PDO mapping parameters

6.5.20.3 Art. No. 55077 IMPACT67 C DO8 2A

Index	Subindex	Description	Default value
1A05H	0	Number of assigned objects, 1st Transmit PDO	3
	1	1st assigned object, group diagnostic	3000 01 08H
	2	2nd assigned object Reserved	3000 02 08H
	3	3rd assigned object Actuator short-circuit Pin 4	3000 03 08H

Tab. 78: Transmit PDO mapping parameters

6.5.20.4 Art. No. 55078 IMPACT67 C DO16 0.5 A

Index	Subindex	Description	Default value
1A05H	0	Number of assigned objects, 1st Transmit PDO	4
	1	1st assigned object, group diagnostic	3000 01 08H
	2	2nd assigned object Reserved	3000 02 08H
	3	3rd assigned object Actuator short-circuit Pin 4	3000 03 08H
	4	4th assigned object Actuator short-circuit Pin 2	3000 04 08H

Tab. 79: Transmit PDO mapping parameters

6.6 Manufacturer-Specific Device Profile CanOpen Modules

6.6.1 Object 6000H: Read Input 8-Bit

Reading of an input value with 8 inputs to be stored in one byte. Addresses are generated using index and subindex, whereby the subindex 0 contains the number of entries. The table below shows the assignment of subindices to inputs.

Subindex	Bit No.	Input	Description
1 (Pin 4)	0	Input 00	Status 1 if input 1
	1	Input 01	Status 1 if input 1
	2	Input 02	Status 1 if input 1
	3	Input 03	Status 1 if input 1
	4	Input 04	Status 1 if input 1
	5	Input 05	Status 1 if input 1
	6	Input 06	Status 1 if input 1
	7	Input 07	Status 1 if input 1
2 (Pin 2) Digital input	0	Input 10	Status 1 if input 1
	1	Input 11	Status 1 if input 1
	2	Input 12	Status 1 if input 1
	3	Input 13	Status 1 if input 1
	4	Input 14	Status 1 if input 1
	5	Input 15	Status 1 if input 1
	6	Input 16	Status 1 if input 1
	7	Input 17	Status 1 if input 1

Tab. 80: Read Input 8-bit

Tab. 81:

6.6.2 Object 6200H: Write Output 8-Bit

The output values for outputs can only be written byte-wise. Addresses are generated using index and subindex, whereby subindex 0 contains the number of entries. The table below shows the assignment to outputs.

Subindex	Bit No.	Output	Default value	Description
1 (Pin 4)	0	Output 00	0	Output 1 if status 1
	1	Output 01	0	Output 1 if status 1
	2	Output 02	0	Output 1 if status 1
	3	Output 03	0	Output 1 if status 1
	4	Output 04	0	Output 1 if status 1
	5	Output 05	0	Output 1 if status 1
	6	Output 06	0	Output 1 if status 1
	7	Output 07	0	Output 1 if status 1
2 (Pin 2)	0	Output 10	0	Output 1 if status 1
	1	Output 11	0	Output 1 if status 1
	2	Output 12	0	Output 1 if status 1
	3	Output 13	0	Output 1 if status 1
	4	Output 14	0	Output 1 if status 1
	5	Output 15	0	Output 1 if status 1
	6	Output 16	0	Output 1 if status 1
	7	Output 17	0	Output 1 if status 1

Tab. 82: Write Output 8-Bit

6.6.3 Object 3000H: Manufacturer-Specific Diagnostic Bytes

The function of this object is to request the diagnostic of each channel.

Subindex	Description	Default value
0	Number of entries → Module-dependent	02H - 04H
1	Group diagnostics (manufacturer status register, lower 8 bit) →all modules	00H
2	Reserved	00H
3	Actuator short-circuit with GND Pin 4 (channel diagnostics) → only modules with outputs	00H
4	Actuator short-circuit with GND Pin 2 (channel diagnostics) → only modules with outputs	00H

Tab. 83: Manufacturer-specific diagnostic bytes

7. Diagnostics

Diagnostic information is an important basis for easy setup and quick troubleshooting.

Clear information from the I/O module and its connected periphery components, such as sensors and actuators, identify, rectify, and therefore minimize downtimes.

7.1 LED Displays

All modules of the IMPACT67 series have separate and clearly arranged displays for bus status, device status, and I/O status. These displays are located on the front of the device.

7.1.1 Bus and Device Status LEDs

The LEDs on the front of the module are clearly marked for identification. Display is achieved through static illumination or flashing of the LEDs. The figure below depicts LED layout and the table lists the functions.

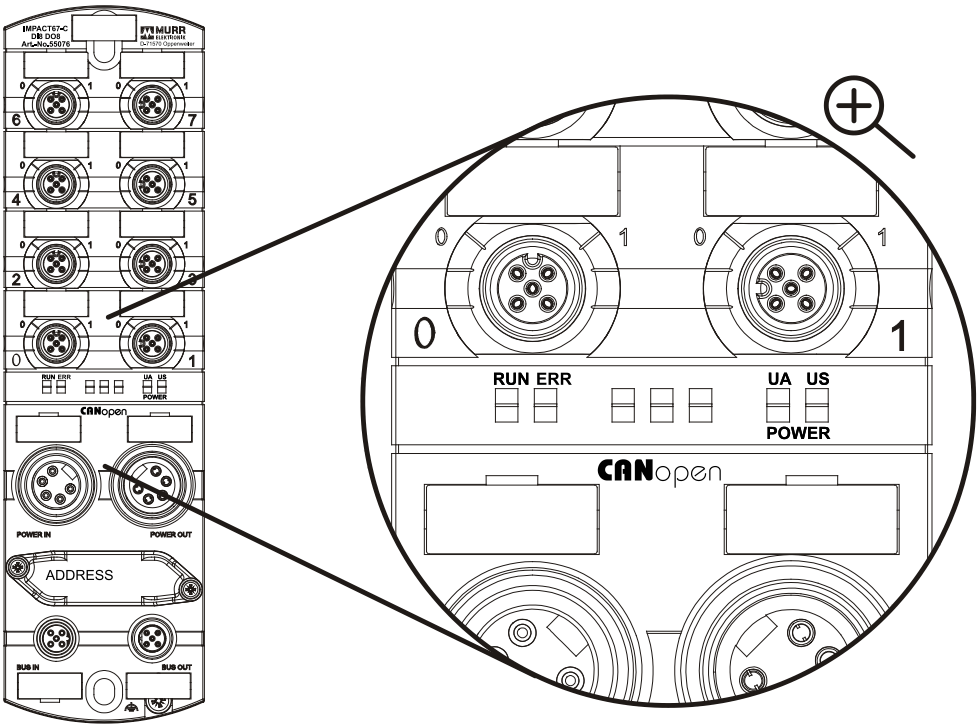


Fig. 11: Bus and device status LEDs on the module front panel

The functions corresponds to the DRP303-3 standard.

Name	LED	Status	Description
ERROR (red)	Off	No error	Device operating normally (Device OK)
	Single flash	Warning limit reached	At least one of the error counters of the CAN controller has reached or exceeded the warning level (too many error frames)
	Flickering	AutoBaud	Auto Baud rate detection in progress
	Double flash	Error Control Event	A guarding error or a heartbeat was detected.
	Triple flash	Sync error	SYNC signal not received within SYNC interval
	On	Bus Off	CAN controller status: Bus off
RUN (green)	Flickering	AutoBaud	Auto Baud rate detection in progress
	Single flash	STOPPED	Device in STOPPED mode
	Blinking	Pre-Operational	Device in Pre-Operational mode
	On	Operational	Device in Operational mode
US POWER (red/green)	Off	No power	Failure of module and sensor power supply
	green	Normal function	Module and sensor power supply applied
	red	Undervoltage	Module and sensor power supply undervoltage
UA POWER (red/green)	Off	No power	Failure of actuator power supply
	green	Normal function	Actuator supply OK
	red	Undervoltage	Undervoltage, actuator power supply

Tab. 84: Function of bus and device status LEDs on the device front panel

A distinction is made between the following indicator states:

- LED on: constant on
- LED off: constant off
- LED flickering: On / off phase at a rate of approx. 10 Hz: on for approx. 50 ms and off for approx. 50 ms.
- LED blinking: On / off phase at a rate of approx. 2.5 Hz: on for approx. 200 ms followed by off for approx. 200 ms.
- LED single flash: a single flash (approx. 200 ms) followed by a long off phase (approx. 1000 ms).
- LED double flash: a sequence of two short flashes (approx. 200 ms), the interval between two flashes is approx. 200 ms. This sequence ends with a long off phase (approx. 1000 ms).
- LED triple flash: a sequence of three short flashes (approx. 200 ms), the interval between the three flashes is approx. 200 ms. This sequence ends with a long off phase (approx. 1000 ms).

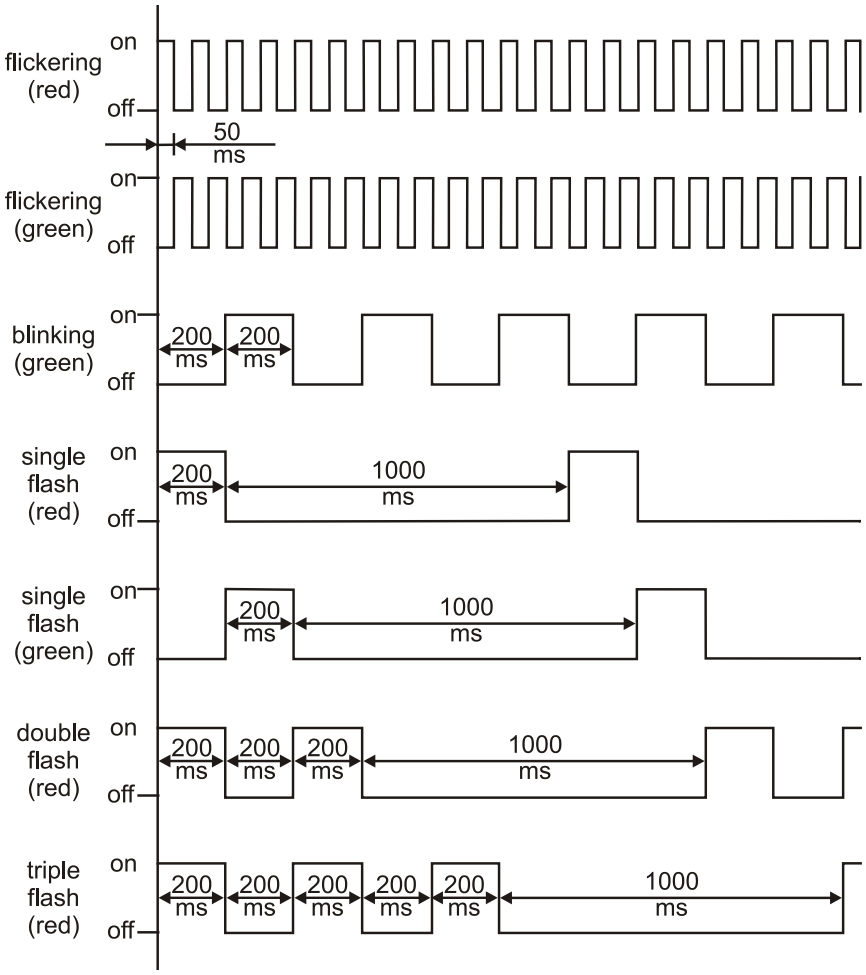
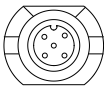
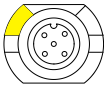


Fig. 12: Status of bus displays and flash rates

7.1.2 I/O Status LEDs at M12 Slots

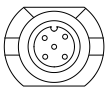
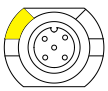
Each input and output is assigned a separate status display They are labeled with '00 to 07' and 10 to 17'. The displays are located directly next to the corresponding M12 socket. This makes it easy to identify the status of peripheral components, such as sensors and actuators.

LED Display of Digital Inputs

Input with NO contact function	Voltage at Input	Logic value	LED display	
	0 V	0		off
	24 V	1		yellow

Tab. 85: LED display of digital inputs

LED Display of Digital Outputs

Output	Logic value	Voltage at output	LED display	
	0	0 V		off
	1	24 V		yellow

Tab. 86: LED display of digital outputs

7.1.3 LED Display for Diagnostics

7.1.3.1 IMPACT67 DI16 modules

Error	LED at M12 socket		LED designation
	Socket No. x		U_S
	Channel 0x	Channel 1x	
Module power supply undervoltage			red
Short-circuit (sensor supply)	both red		

Tab. 87: LED display for diagnostics

7.1.3.2 IMPACT67 DI8 DO8 modules

Error	LED at M12 socket		LED designation	
	Socket No. x		U_A	U_S
	Channel 0x	Channel 1x		
Module power supply undervoltage				red
I/O power supply undervoltage			red	
No actuator supply			off	
actuator shutdown	red	red		
Short-circuit (sensor supply)	both red			

Tab. 88: LED display for diagnostics

7.1.3.3 IMPACT67 DO8 modules

Error	LED at M12 socket		LED designation	
	Socket No. x		U_A	U_S
	Channel 0x	Channel 1x		
Module power supply undervoltage				red
I/O power supply undervoltage			red	
No actuator supply			off	
Actuator shutdown	red			

Tab. 89: LED display for diagnostics

7.1.3.4 IMPACT67 DO16 modules

Error	LED at M12 socket		LED designation	
	Socket No. x		U_A	U_S
	Channel 0x	Channel 1x		
Module power supply undervoltage				red
I/O power supply undervoltage			red	
No actuator supply			off	
Actuator shutdown	red	red		

Tab. 90: LED display for diagnostics

7.2 Sensor Power Supply

Power supply for the sensors is provided at the M12 sockets between pin 1 (+24V) and Pin 3 (0V).

7.2.1 Short-circuit or overload

The sensor power supply is protected by a self-resetting multifuse each slot. The maximum current draw for the sensor power supply is 200 mA per M12 slot. Note the derating in the drawing below:

Derating Sensor Power Supply

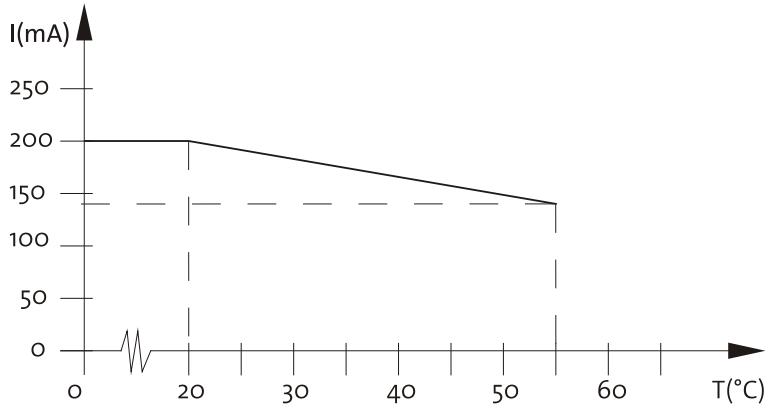


Fig. 13: Derating sensor power supply

In the event of a short circuit or overload in the sensor supply, the following symptoms are observed on the IMPACT67 module:

- The diagnostic LEDs light up red on the associated M12 socket.
- The respective diagnostic data are transferred over the bus to the master.
- All other inputs function correctly.

When an overload or short-circuit is rectified or the sensor supply is connected, the LEDs and diagnostic data are reset.

7.2.2 Sensor Power Supply Undervoltage

There are two levels of undervoltage detection :

1. Us < 18 V : In this case the module is still working but:

- the POWER - U_S LED lights up red
- the respective diagnostic data are transferred via the bus to the master

2. U_S < 12 V : In this case, the outputs have failed but bus communication still functions:

- the POWER U_A LED goes out
- all outputs are reset to 0

3. Us < 6.5 V : In this case, the device shuts down.

7.3 Actuator Power Supply

7.3.1 Short-Circuit or Overload

In the event of an output short-circuit or overload, the following symptoms are observed on the IMPACT67 module:

- the diagnostic LEDs light up red on the associated M12 socket
- the output status LED extinguishes
- the respective diagnostic data are transferred over the bus to the master

In order to reactivate an output after a short circuit or overload has been corrected, the following procedure must be observed:

1. The output must first be set to “0”
2. and then to “1” again

7.3.2 Undervoltage

There are two levels of undervoltage detection :

1. U_A < 18 V : In this case the module is still working but :

- the POWER U_A LED lights up red
- the respective diagnostic data are transferred to the master

2. U_A < 12 V : In this case, the outputs have failed but bus communication still functions:

- the POWER U_A LED goes out
- all outputs are reset to 0

7.4 Diagnostics vie the Fieldbus

The following diagnostics are reported:

- Sensor short-circuit group signal
- Actuator shutdown by channel and group signal
- Module power supply undervoltage (the sensor power supply is smaller than 18 V)
- Actuator power supply undervoltage (the actuator power supply is small than 18 V)

With CANopen, the diagnostics are sent in separate diagnostic telegrams

7.4.1 CANopen Diagnostic Concept

An emergency telegram (EMCY telegram) is always transmitted when an error occurs. When an error has been corrected, an EMCY telegram with NO-ERROR content is transmitted.

The EMCY telegram structure is described in greater detail below.

7.4.1.1 EMCY Telegram Structure

The EMCY telegram consists of 8 bytes of data. The channel diagnostics are displayed in the manufacturer-specific section (bytes 5 to 7).

Byte	0-1	2	3-4	5	6	7
Content	For Error Code, see the table below	Error register Object 1001h	Reserved	Actuator short-circuit Pin 2 (from Object 3000h)	Actuator short-circuit Pin 4 (from Object 3000h)	Group diagnostic Manufacturer status register Object 1002h lower 8 bit

Tab. 91: EMCY telegram structure

7.4.1.2 Supported Error Codes (EMCY Bytes 0+1)

Error code	General field bus diagnostics	Cause
0x0000	ERROR_RESET_OR_NO_ERROR	An error was corrected
0x1000	GENERIC_ERROR	Generic error
0x6101	SOFTWARE_RX_QUEUE_OVERRUN	Internal overflow in Rx software buffer
0x6102	SOFTWARE_TX_QUEUE_OVERRUN	Internal overflow in Tx software buffer
0x8100	COMMUNICATION	Synchronization, CAN controller in warning level Tx/Rx y error counter >=128
0x8130	LIFE_GUARD_ERROR	Node guard error Heartbeat error
Error Code	Device-specific diagnostics	Cause
0x2100	CURRENT_DEVICE_INPUT_SIDE	Sensor short-circuit
0x2320	SHORT_CIRCUIT_AT_OUTPUTS	Actuator short-circuit with GND
0x3120	INPUT_VOLTAGE_TO_LOW	Module and sensor power supply undervoltage <18V
0x3320	OUTPUT_VOLTAGE_TO_LOW	Actuator power supply undervoltage <18 V

Tab. 92: Supported Error Codes (EMCY Bytes 0+1)

7.4.1.3 Error Register (1001H), (EMCY Byte 2)

Bit	Significance	Comments
0	Generic error	
1	Current	
2	Voltage	
3	Not used	
4	Communication error	
5	Not used	
6	Not used	
7	Manufacturer-specific	

Tab. 93: Error Register (1001H), (EMCY Byte 2)

7.4.1.4 Channel-wise Diagnostics (EMCY Bytes 5-6)

The data displayed in Bytes 5 and 6 are described by the fault cause described in Byte 7 (manufacturer status register).

Module/sensor power supply undervoltage

Byte	5	6	7
Content	00H	00H	0x1H

Tab. 94: Channel-wise diagnostics

Actuator power supply undervoltage

Byte	5	6	7
Content	00H	00H	0x4H

Tab. 95: Channel-wise diagnostics

Sensor short-circuit :

Byte	5	6	7
Content	00H	00H	10H

Tab. 96: Channel-wise diagnostics

Actuator short-circuit with GND:

Byte	5	6	7
Content	Actuator short-circuit Pin 2 (channel diagnostics) (Object 3000 Subindex 4)	Actuator short-circuit Pin 4 (channel diagnostics) (object 3000 subindex 3)	20H

Tab. 97: Channel-wise diagnostics

7.4.1.5 Manufacturer Status Register (EMCY Byte 7)

Structure of Byte 7.

Bit	Significance	Comments
0	Sensor undervoltage	
1	Reserved	
2	Undervoltage actuator supply	
3	Reserved	
4	Sensor short-circuit at M12 socket	
5	Actuator shutdown[3]	
6 to 31	Reserved	

Tab. 98: Manufacturer status register (EMCY Byte 7)

7.4.2 Diagnostics under 2nd Transmit PDO

In addition to the emergency telegram, it is also possible to transfer diagnostic data in the activated 2nd transmit PDO.

7.4.2.1 Structure of 2nd Transmit PDO

The 2nd transmit PDO consists of 4 bytes. The table below shows the structure of the 2nd transmit PDO.

Byte 0	Byte 1	Byte 2	Byte 3
Sum diagnosis	Channel diagnostics		
Manufacturer status register Object 1002h lower 8 bit (Object 3000 Subindex 1)	Reserved (0x00)	Actuator short-circuit Pin 4 (object 3000 subindex 3)	Actuator short-circuit Pin 2 (Object 3000 Subindex 4)

Tab. 99: Structure of 2nd transmit PDO

[3] only if outputs are parameterized

8. Technical Data

8.1 Art. No. 55075 IMPACT67 C DI16

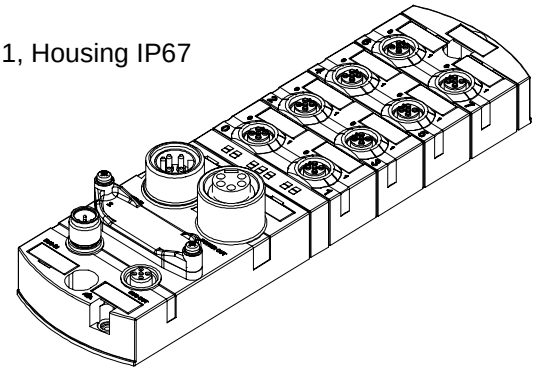
General

CANopen Slave according to DS301 V4.02 and DS401 V2.1, Housing IP67

with 16 inputs

[M12 slot, Pin 4] → 8 inputs

[M12 slot, Pin 2] → 8 inputs



EMC

EN 61000-4-2 ESD .....: Contact ± 4 kV, air ± 8 kV
EN 61000-4-3 RF field .....: 10 V/m
EN 61000-4-4 Burst .....: ± 2 kV
EN 61000-4-5 Surge .....: asym./sym. ± 500 V (DC net input)
EN 61000-4-6 HF-asymmetric .....: 10 V
EN 55011 Interference field strength .....: QP 40 dBµV/m (30 - 230 MHz),
..... QP 47 dBµV/m (230 - 1000 MHz) (class A)

Ambient Conditions

Operating temperature .....: 0°C to +55°C
Storage temperature .....: -25°C to 70°C
Enclosure type according to IEC 60529 .....: IP 67

Mechanical Ambient Conditions

Oscillation according to EN 60068 Part 2-6 .....: 5 - 60 Hz: constant amplitude 0.35 mm,
..... 60 – 150 Hz: constant acceleration 5 g
Shock according to EN 60068 Part 2-27 .....: Amplitude 15 g, 11 ms duration

Miscellaneous

Dimensions (L × W × H) .....: 225 × 63 × 39 mm
Attachment distance .....: 208 mm
Weight .....: approx. 420 g

Bus Data

Transfer protocol .....: CAN, Layer 7 CANopen
Transfer rates .....: 10, 20, 50, 100, 125, 250, 500, 800, 1000 Kbit/s
..... and automatic recognition
Potential disconnectedness .....: 500 V between bus and internal logic with optical
..... coupler and DC / DC converter
Modes .....: cyclic and acyclic synchronous PDOs,

..... asynchronous PDOs
Communication objects .....: 2 TxPDOs,
..... 1 SDO,
..... 1 emergency object
Addressing .....: 1 to 99 with two rotary switches adjustable
CiA e.V. Vendor ID .....: 79Dec, 4FHex

Connection Possibilities

Supply cable .....: 2 × connector 7/8" female / male connector
Data cable .....: 2 × M12 connector 5-pin
..... (female / male connector A-coded)
Inputs .....: 8 × 5-pin M12 connector
Maximum length of I/O cable.....: < 30 m

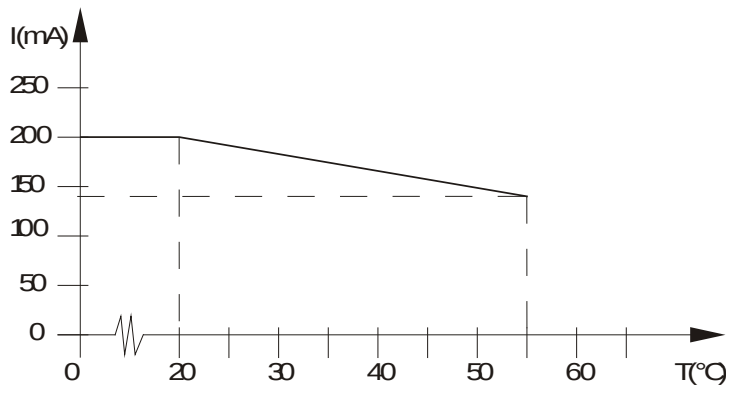
Power Supply

Voltage U_s over 7/8” power in connector.....: 24 VDC
Voltage U_s range .....: 18 – 30 VDC
Actuator supply 7/8” power in connector .....: max. 9 A
Sensor supply 7/8” power in connector .....: max. 9 A
Core cross-section.....: max. 1.5 mm²

Inputs

Number of inputs .....: 16
Input characteristics.....: EN 61131-2 Type 2
Supply for sensors .....: max. 200 mA per socket
Short-circuit protection for sensors .....: multifuse,
..... up to 100 mA load: automatic startup
..... from 100 mA load: a reset is required
Multifuse reaction time (time to trip) .....: 1s at IK >= 1 A and 23°C

Derating Sensor Supply



8.2 Art. No. 55076 IMPACT67 C DI8 DO8

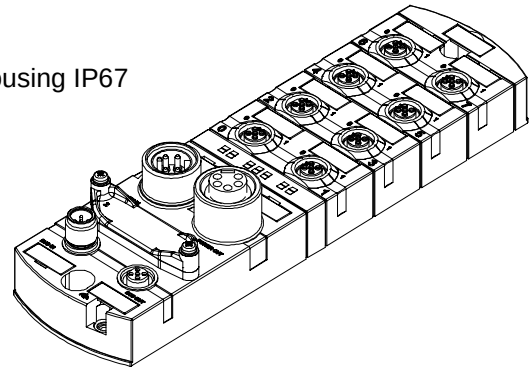
General

CANopen Slave according to DS301 V4.02 and DS401 V2.1, Housing IP67

with 8 inputs and 8 outputs

[M12 slot 4, 5, 6, 7; Pin 4 and Pin 2] → 8 inputs

[M12 slot 0, 1, 2, 3; Pin 4 and Pin 2] → 8 outputs



EMC

EN 61000-4-2 ESD .....: Contact ± 4 kV, air ± 8 kV
EN 61000-4-3 RF field .....: 10 V/m
EN 61000-4-4 Burst .....: ± 2 kV
EN 61000-4-5 Surge .....: asym./sym. ± 500 V (DC net input)
EN 61000-4-6 HF asymmetric .....: 10 V
EN 55011 Interference field strength .....: QP 40 dBµV/m (30 - 230 MHz),
..... QP 47 dBµV/m (230 - 1000 MHz) (class A)

Ambient Conditions

Operating temperature .....: 0°C to +55°C
Storage temperature .....: -25°C to 70°C
Enclosure type according to IEC 60529 .....: IP 67

Mechanical Ambient Conditions

Oscillation according to EN 60068 Part 2-6 .....: 5 - 60 Hz: constant amplitude 0.35 mm,
..... 60 – 150 Hz: constant acceleration 5 g
Shock according to EN 60068 Part 2-27 .....: Amplitude 15 g, 11 ms duration

Miscellaneous

Dimensions (L × W × H) .....: 225 × 63 × 39 mm
Attachment distance .....: 208 mm
Weight .....: approx. 420 g

Bus Data

Transfer protocol .....: CAN, Layer 7 CANopen
Transfer rates .....: 10, 20, 50, 100, 125, 250, 500, 800, 1000 Kbit/s
..... and automatic recognition
Potential disconnectedness .....: 500 V between bus and internal logic with optical
..... coupler and DC / DC converter
Modes .....: cyclic and acyclic synchronous PDOs,
..... asynchronous PDOs
Communication objects .....: 2 TxPDOs, 1 RxPDO,
..... 1 SDO,

..... 1 emergency object
Addressing .....: 1 to 99 with two rotary switches adjustable
CiA e.V. Vendor ID .....: 79Dec, 4FHex

Connection Possibilities

Supply cable .....: 2 × connector 7/8" female / male connector
Data cable .....: 2 × M12 connector 5-pin
..... (female / male connector A-coded)
Inputs .....: 4 × 5-pin M12 connector
Outputs .....: 4 × 5-pin M12 connector
Maximum length of I/O cable.....: < 30 m

Power Supply

Voltage U_s / U_a over 7/8" power in connector.....: 24 VDC
Voltage U_s / U_a range.....: 18 – 30 VDC
Actuator supply 7/8" power in connector .....: max. 9 A
Sensor supply 7/8" power in connector .....: max. 9 A
Core cross-section.....: max. 1.5 mm²

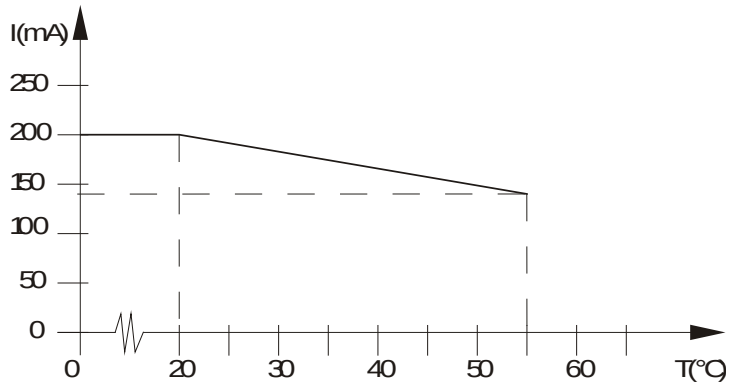
Outputs

Number of outputs .....: 8
Actuator current load .....: approx. 2 A per actuator
Cable length.....: with 0.75 mm² max. 10 m,
..... with 0.34 mm² max. 5 m
Core cross-section.....: M12 (max. 0.75 mm^2)
Switching frequency .....: approx. 50 Hz, 50% duty ratio
Switching frequency inductive load .....: approx. 10 Hz
Lamp load.....: max. 40 W

Inputs

Number of inputs.....: 8
Input characteristics.....: EN 61131-2, Type 2
Supply for sensors .....: max. 200 mA per socket
Short-circuit protection for sensors .....: multifuse,
..... up to 100 mA load: automatic startup
..... from 100 mA load: a reset is required
Multifuse reaction time (time to trip) .....: 1s at IK >= 1 A and 23°C

Derating Sensor Supply



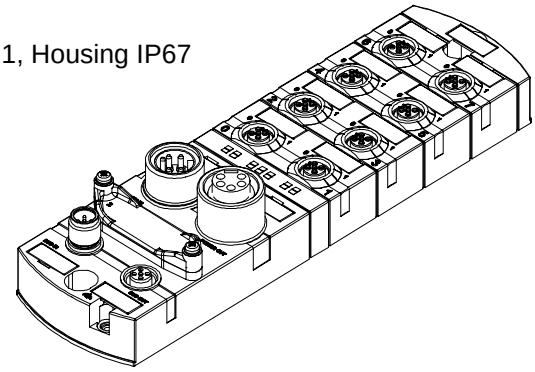
8.3 Art. No. 55077 IMPACT67 C DO8

General

CANopen Slave according to DS301 V4.02 and DS401 V2.1, Housing IP67

with 8 outputs

[M12 slot, Pin 4] → 8 outputs



EMC

EN 61000-4-2 ESD .....: Contact ± 4 kV, air ± 8 kV
EN 61000-4-3 RF field .....: 10 V/m
EN 61000-4-4 Burst .....: ± 2 kV
EN 61000-4-5 Surge .....: asym./sym. ± 500 V (DC net input)
EN 61000-4-6 HF-asymmetric .....: 10 V
EN 55011 Interference field strength .....: QP 40 dBµV/m (30 - 230 MHz),
..... QP 47 dBµV/m (230 - 1000 MHz) (class A)

Ambient Conditions

Operating temperature .....: 0°C to +55°C
Storage temperature .....: -25°C to 70°C
Enclosure type according to IEC 60529 .....: IP 67

Mechanical Ambient Conditions

Oscillation according to EN 60068 Part 2-6 .....: 5 - 60 Hz: constant amplitude 0.35 mm,
..... 60 – 150 Hz: constant acceleration 5 g
Shock according to EN 60068 Part 2-27 .....: Amplitude 15 g, 11 ms duration

Miscellaneous

Dimensions (L × W × H) .....: 225 × 63 × 39 mm
Attachment distance .....: 208 mm
Weight .....: approx. 420 g

Bus Data

Transfer protocol .....: CAN, Layer 7 CANopen
Transfer rates .....: 10, 20, 50, 100, 125, 250, 500, 800, 1000 Kbit/s
..... and automatic recognition
Potential disconnectedness .....: 500 V between bus and internal logic with optical
..... coupler and DC / DC converter
Modes .....: cyclic and acyclic synchronous PDOs,
..... asynchronous PDOs
Communication objects .....: 1 TxPDOs, 1 RxPDO,
..... 1 SDO,

..... 1 emergency object
Addressing .....: 1 to 99 with two rotary switches adjustable
CiA e.V. Vendor ID .....: 79Dec, 4FHex

Connection Possibilities

Supply cable .....: 2 × connector 7/8" female / male connector
Data cable .....: 2 × M12 connector 5-pin
..... (female / male connector A-coded)
Outputs .....: 8 × 5-pin M12 connector
Maximum length of I/O cable.....: < 30 m

Power Supply

Voltage U_s / U_a over 7/8” power in connector.....: 24 VDC
Voltage U_s / U_a range.....: 18 – 30 VDC
Actuator supply 7/8” power in connector .....: max. 9 A
Sensor supply 7/8” power in connector .....: max. 9 A
Core cross-section.....: max. 1.5 mm²

Outputs

Number of outputs .....: 8
Actuator current load .....: approx. 2 A per actuator
Cable length.....: with 0.75 mm² max. 10 m,
..... with 0.34 mm² max. 5 m
Core cross-section.....: M12 (max. 0.75 mm^2)
Switching frequency .....: approx. 50 Hz
Switching frequency inductive load .....: approx. 10 Hz
Lamp load.....: max. 40 W

8.4 Art. No. 55078 IMPACT67 C DO16

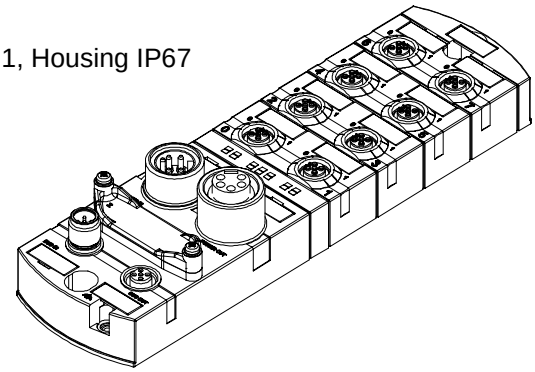
General

CANopen Slave according to DS301 V4.02 and DS401 V2.1, Housing IP67

with 16 outputs

[M12 slot, contact 4] → 8 outputs

[M12 slot, contact 2] → 8 outputs



EMC

EN 61000-4-2 ESD .....: Contact ± 4 kV, air ± 8 kV
EN 61000-4-3 RF field .....: 10 V/m
EN 61000-4-4 Burst .....: ± 2 kV
EN 61000-4-5 Surge .....: asym./sym. ± 500 V (DC net input)
EN 61000-4-6 HF asymmetric .....: 3 V
EN 61000-4-8 Magnetic field 50 Hz .....: 30 A/m
EN 55011 Interference field strength .....: QP 40 dBµV/m (30 - 230 MHz),
..... QP 47 dBµV/m (230 - 1000 MHz) (class A)

Ambient Conditions

Operating temperature .....: 0°C to +55°C
Storage temperature .....: -25°C to 70°C
Enclosure type according to IEC 60529 .....: IP 67

Mechanical Ambient Conditions

Oscillation according to EN 60068 Part 2-6 .....: 5 - 60 Hz: constant amplitude 0.35 mm,
..... 60 – 150 Hz: constant acceleration 5 g
Shock according to EN 60068 Part 2-27 .....: Amplitude 15 g, 11 ms duration

Miscellaneous

Dimensions (L × W × H) .....: 225 × 63 × 39 mm
Attachment distance .....: 208 mm
Weight .....: approx. 420 g

Bus Data

Transfer protocol .....: CAN, Layer 7 CANopen
Transfer rates .....: 10, 20, 50, 100, 125, 250, 500, 800, 1000 Kbit/s
..... and automatic recognition
Potential disconnectedness .....: 500 V between bus and internal logic with optical
..... coupler and DC / DC converter
Modes .....: cyclic and acyclic synchronous PDOs,
..... asynchronous PDOs
Communication objects .....: 1 TxPDOs, 1 RxPDO,

..... 1 SDO,
..... 1 emergency object
Addressing .....: 1 to 99 with two rotary switches adjustable
CiA e.V. Vendor ID .....: 79Dec, 4FHex

Connection Possibilities

Supply cable .....: 2 × connector 7/8" female / male connector
Data cable .....: 2 × M12 connector 5-pin
..... (female / male connector A-coded)
Outputs .....: 8 × 5-pin M12 connector
Maximum length of I/O cable.....: < 30 m

Power Supply

Voltage U_s / U_a over 7/8” power in connector.....: 24 VDC
Voltage U_s / U_a range.....: 18 – 30 VDC
Actuator supply 7/8” power in connector .....: max. 9 A
Sensor supply 7/8” power in connector .....: max. 9 A
Core cross-section.....: max. 1.5 mm²

Outputs

Number of outputs .....: 16
Actuator current load .....: approx. 0.5 A per actuator
Cable length.....: with 0.75 mm² max. 10 m,
..... with 0.34 mm² max. 5 m
Core cross-section.....: M12 (max. 0.75 mm^2)
Switching frequency .....: approx. 50 Hz 50% duty ratio
Switching frequency inductive load .....: approx. 10 Hz duty ratio
Lamp load.....: max. 10 W

Abbreviations

CAL	CAN Application Layer. User layer (ISO/OSI layer 7) specified by the CiA.
CAN	Controller Area Network
CAN in Automation e. V.	Organization of CAN-Bus device manufacturers and users
CiA Draft Standard 102	Description of physical CAN communication (layer 2) for industrial application
CiA Draft Standard 301	Description of application and communications profile for industrial systems
CiA Draft Standard 401	Description of device profile for generic input and output modules
CMS	CAN based message specification: A service element available to the application layer for the manipulation of objects
COB	Communication Object: Messages are transmitted in the network in COBs and viewed as communication objects
COB-ID	COB Identifier: Each communication object is unambiguously defined by the COB-ID. The COB-ID marks the communication object's priority
CSMA/CA	Carrier Sense Multiple Access / Collision Avoidance
DBT	COB-ID Distributor. A service element of the application layer; it assigns the COB-IDs to the communication objects of the CMS services
DI	Digital Input
DIN	German standards institute
DO	Digital Output
EN	European Standard
EC	European Community

EMC	Electromagnetic Compatibility
IEC	International Electrotechnical Commission
ISO	International Standards Organization
LED	Light Emitting Diode
LMT	Layer Management. Enables the setting of layer-related parameters to a node
NMT	Network Management. NMT provides services for initializing and monitoring the nodes in a network
MNS	Module Network Status
OSI	Open Systems Interconnection
PDO	Process Data Object. Object for process data exchange between various devices
RTR	Remote Transmission Request. Request for data telegram with the same identifier used for data transmission
SDO	Service Data Object, Objects for access and manipulation to data in the object directory
PLC	Programmable Logic Controller
SYNC	Synchronization Object

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